

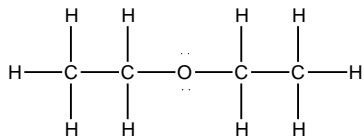
## Chapter Two

Topic: Molecular Representation

Section: 2.1

Difficulty Level: Easy

1. What is the molecular formula for the following compound?



- A)  $\text{C}_2\text{H}_6\text{O}$
- B)  $\text{C}_4\text{H}_6\text{O}$
- C)  $\text{C}_4\text{H}_{10}\text{O}$
- D)  $\text{C}_2\text{H}_4\text{O}$
- E) None of these

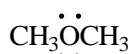
Ans: C

Topic: Molecular Representation

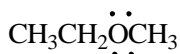
Section: 2.1

Difficulty Level: Easy

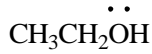
2. Which of the following compounds have a molecular formula of  $\text{C}_2\text{H}_6\text{O}$ ?



I



II



III



IV

- A) I
- B) II
- C) III
- D) IV
- E) Both I & III

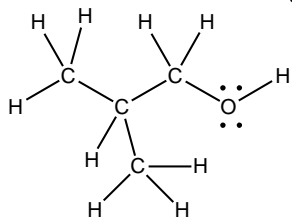
Ans: E

Topic: Molecular Representation

Section: 2.1

Difficulty Level: Easy

3. Which of the following is the correct condensed structure for the following compound?



- A)  $\text{CH}_3\text{CH}_3\text{CH}_2\text{OH}$
- B)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$
- C)  $(\text{CH}_3)_2\text{CHCH}_2\text{OH}$
- D)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{OCH}_3$
- E)  $\text{CH}_3\text{C}_2\text{H}_3\text{CH}_3\text{OH}$

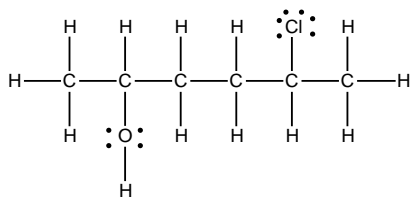
Ans: C

Topic: Molecular Representation

Section: 2.1

Difficulty Level: Easy

4. Which of the following is the correct condensed structure for the following compound?



- A)  $\text{CH}_3\text{CHOHCH}_2\text{CHClCH}_3$
- B)  $\text{CH}_3\text{CHOH}(\text{CH}_2)_2\text{CHClCH}_3$
- C)  $(\text{CH}_3)_2\text{CHOHCH}_2\text{CH}_2\text{Cl}$
- D)  $\text{CH}_3\text{CHCH}_2\text{CH}_2\text{OHCH}_3\text{CHCl}$
- E)  $\text{CH}_3\text{C}_2\text{H}_4\text{CH}_3\text{OHCl}$

Ans: B

Topic: Molecular Representation

Section: 2.1

Difficulty Level: Medium

5. Which of the following is the correct condensed structure for the following compound?

- A)  $\text{CH}_2=\text{CH}(\text{CH}_2)_3\text{C}(\text{CH}_3)_3$
- B)  $\text{CH}(\text{CH}_2)_4\text{C}(\text{CH}_3)_3$
- C)  $(\text{CH}_3)_2\text{CH}(\text{CH}_2)_4\text{CH}_3$
- D)  $\text{CH}_2\text{CH}(\text{CH}_2)_3\text{C}(\text{CH}_3)_3$
- E)  $(\text{CH})_3(\text{CH}_2)_3\text{C}(\text{CH}_3)_3$

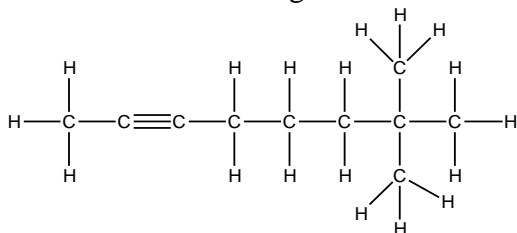
Ans: A

Topic: Molecular Representation

Section: 2.1

Difficulty Level: Medium

6. Which of the following is the correct condensed structure for the following compound?



- A)  $\text{CH}_3\text{C}_2(\text{CH}_2)_3\text{C}(\text{CH}_3)_3$
- B)  $\text{CH}_3\text{CC}(\text{CH}_2)_3\text{C}(\text{CH}_3)_2\text{CH}_3$
- C)  $(\text{CH}_3)_3\text{C}_2(\text{CH}_2)_3\text{CH}_3$
- D)  $\text{CH}_3\text{C}\equiv\text{C}(\text{CH}_2)_3\text{C}(\text{CH}_3)_3$
- E)  $\text{CH}_3\text{CC}(\text{CH}_2)_3\text{C}(\text{CH}_3)_3$

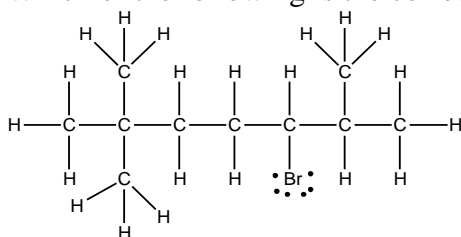
Ans: D

Topic: Molecular Representation

Section: 2.1

Difficulty Level: Medium

7. Which of the following is the correct condensed structure for the following compound?



- A)  $\text{CH}_3\text{C}(\text{CH}_3)_2(\text{CH}_2)_2(\text{CH})\text{BrC}(\text{CH}_3)_2$
- B)  $\text{CH}_3\text{CH}_3\text{CH}_3\text{C}(\text{CH}_2)_2\text{C}(\text{CH}_3)_2\text{CHBr}$
- C)  $(\text{CH}_3)_3\text{C}(\text{CH}_2)_3\text{BrCHCH}_3\text{CH}_3$
- D)  $\text{CH}_3\text{CH}_3\text{CH}_3\text{C}(\text{CH}_2)_2\text{CHBrCHCH}_3\text{CH}_3$
- E)  $(\text{CH}_3)_3\text{C}(\text{CH}_2)_2\text{CHBrCH}(\text{CH}_3)_2$

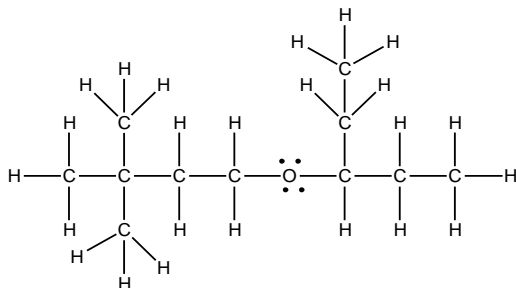
Ans: E

Topic: Molecular Representation

Section: 2.1

Difficulty Level: Hard

8. Provide correct condensed structure for the following compound.



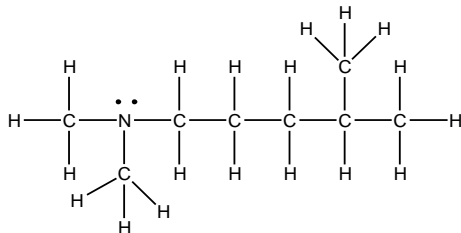
Ans:  $(\text{CH}_3)_3\text{C}(\text{CH}_2)_2\text{OCH}(\text{CH}_2\text{CH}_3)_2$

Topic: Molecular Representation

Section: 2.1

Difficulty Level: Hard

9. Provide correct condensed structure for the following compound.



Ans:  $(\text{CH}_3)_2\text{N}(\text{CH}_2)_3\text{CH}(\text{CH}_3)_2$

Topic: Molecular Representation

Section: 2.1

Difficulty Level: Easy

10. Which of the following is the correct molecular formula for  $(\text{CH}_3\text{CH}_2)_4\text{C}$ ?

- A)  $\text{C}_8\text{H}_{20}$
- B)  $\text{C}_5\text{H}_{20}$
- C)  $\text{C}_9\text{H}_{20}$
- D)  $\text{C}_6\text{H}_5$
- E)  $\text{C}_3\text{H}_{20}$

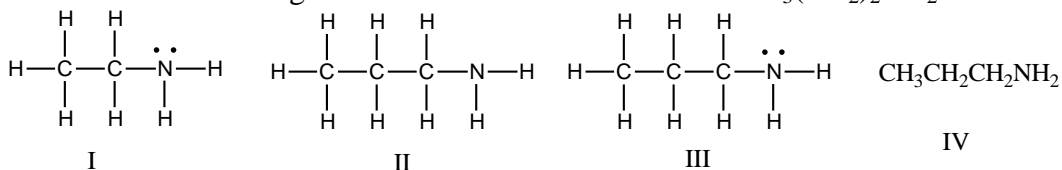
Ans: C

Topic: Molecular Representation

Section: 2.1

Difficulty Level: Easy

11. Which of the following is the correct Lewis structure for  $\text{CH}_3(\text{CH}_2)_2\text{NH}_2$ ?



- A) I
- B) II
- C) III
- D) IV
- E) Both II & III

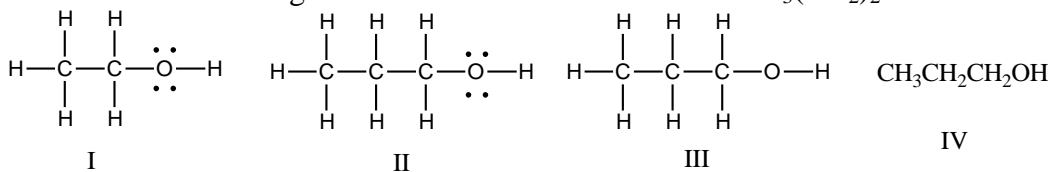
Ans: C

Topic: Molecular Representation

Section: 2.1

Difficulty Level: Easy

12. Which of the following is the correct Lewis structure for  $\text{CH}_3(\text{CH}_2)_2\text{OH}$ ?



- A) I
- B) II
- C) III
- D) IV
- E) Both II & III

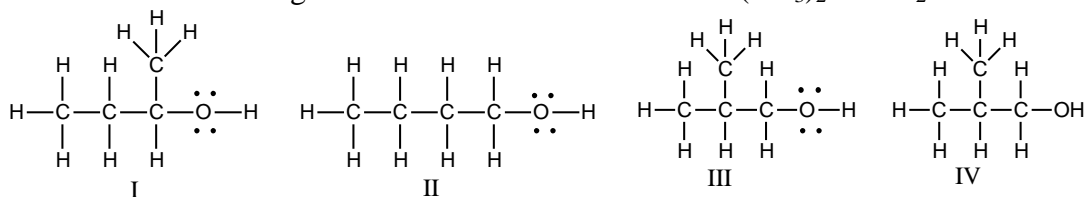
Ans: B

Topic: Molecular Representation

Section: 2.1

Difficulty Level: Easy

13. Which of the following is the correct Lewis structure for  $(\text{CH}_3)_2\text{CHCH}_2\text{OH}$ ?



- A) I  
 B) II  
 C) III  
 D) IV  
 E) Both III & IV

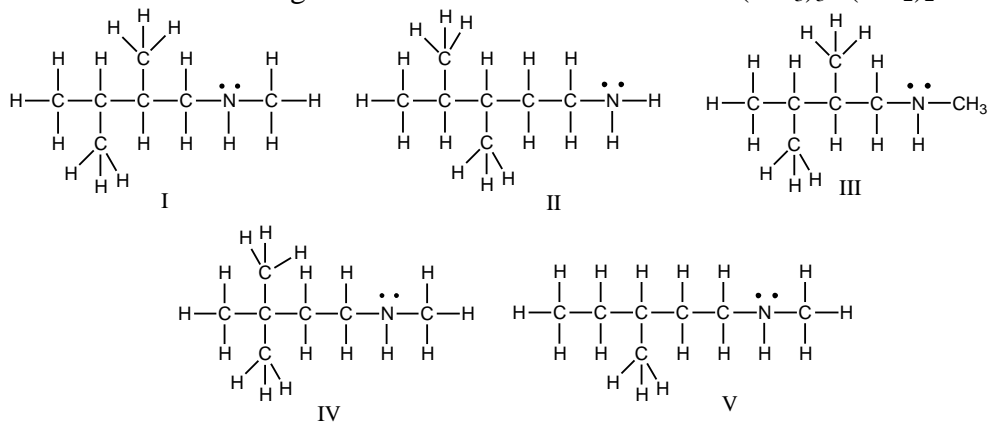
Ans: C

Topic: Molecular Representation

Section: 2.1

Difficulty Level: Medium

14. Which of the following is the correct Lewis structure for  $(\text{CH}_3)_3\text{C}(\text{CH}_2)_2\text{NHCH}_3$ ?



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

Ans: D

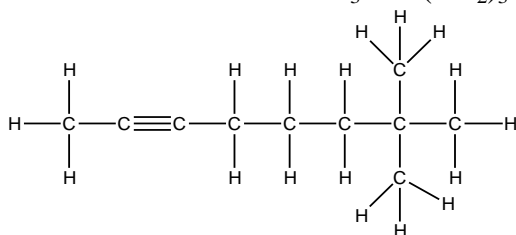
Topic: Molecular Representation

Section: 2.1

Difficulty Level: Medium

15. Draw the Lewis structure for  $\text{CH}_3\text{C}\equiv\text{C}(\text{CH}_2)_3\text{C}(\text{CH}_3)_3$ .

Ans:



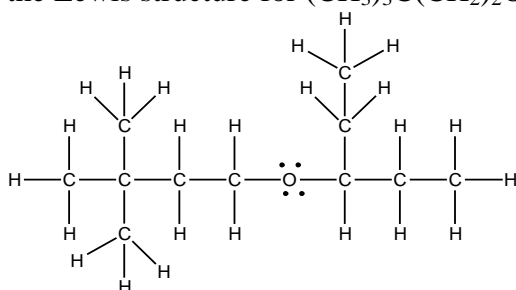
Topic: Molecular Representation

Section: 2.1

Difficulty Level: Hard

16. Draw the Lewis structure for  $(\text{CH}_3)_3\text{C}(\text{CH}_2)_2\text{OCH}(\text{CH}_2\text{CH}_3)_2$ .

Ans:

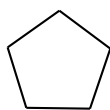


Topic: Bond Line Structure

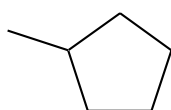
Section: 2.2

Difficulty Level: Easy

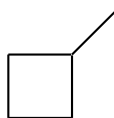
17. Which of the following bond-line structures are of the same compound?



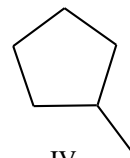
I



II



III



IV

- A) I & II
- B) II & III
- C) III & IV
- D) II & IV
- E) None of these

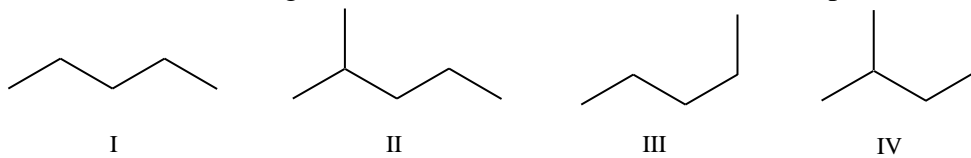
Ans: D

Topic: Bond Line Structure

Section: 2.2

Difficulty Level: Easy

18. Which of the following bond-line structures are of the same compound?



- A) I & III
- B) II & III
- C) III & IV
- D) II & IV
- E) None of these

Ans: A

Topic: Bond Line Structure

Section: 2.2

Difficulty Level: Easy

19. How many H atoms are connected to the indicated carbon atom?



- A) one
- B) two
- C) three
- D) four
- E) none

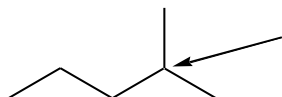
Ans: E

Topic: Bond Line Structure

Section: 2.2

Difficulty Level: Easy

20. How many H atoms are connected to the indicated carbon atom?



- A) one
- B) two
- C) three
- D) four
- E) none

Ans: A

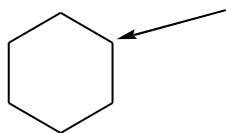
Topic: Bond Line Structure

Section: 2.2

Difficulty Level: Easy



21. How many H atoms are connected to the indicated carbon atom?



- A) one
- B) two
- C) three
- D) four
- E) none

Ans: B

Topic: Bond Line Structure

Section: 2.2

Difficulty Level: Easy

22. How many H atoms are connected to the indicated carbon atom?



- A) one
- B) two
- C) three
- D) four
- E) none

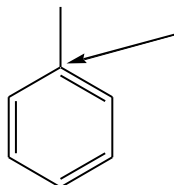
Ans: A

Topic: Bond Line Structure

Section: 2.2

Difficulty Level: Easy

23. How many H atoms are connected to the indicated carbon atom?



- A) one
- B) two
- C) three
- D) four
- E) none

Ans: E

Topic: Bond Line Structure

Section: 2.2

Difficulty Level: Easy

24. For the following transformation how many H atoms are added or lost?



- A) Added one
- B) Added two
- C) Lost one
- D) Lost two
- E) No change

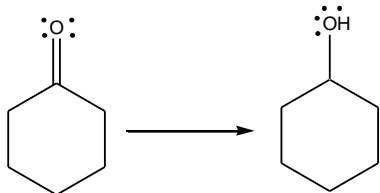
Ans: D

Topic: Bond Line Structure

Section: 2.2

Difficulty Level: Easy

25. For the following transformation how many H atoms are added or lost?



- A) Added one
- B) Added two
- C) Lost one
- D) Lost two
- E) No change

Ans: B

Topic: Bond Line Structure

Section: 2.2

Difficulty Level: Easy

26. For the following transformation how many H atoms are added or lost?



- A) Added one
- B) Added two
- C) Lost one
- D) Lost two
- E) No change

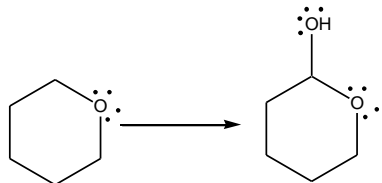
Ans: E

Topic: Bond Line Structure

Section: 2.2

Difficulty Level: Easy

27. For the following transformation how many H atoms are added or lost?



- A) Added one
- B) Added two
- C) Lost one
- D) Lost two
- E) No change

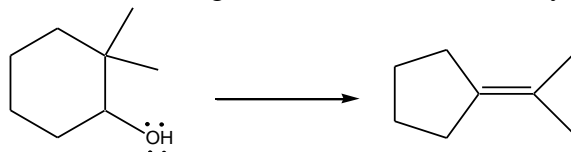
Ans: E

Topic: Bond Line Structure

Section: 2.2

Difficulty Level: Medium

28. For the following transformation how many H atoms are added or lost?



- A) Added one
- B) Added two
- C) Lost one
- D) Lost two
- E) No change

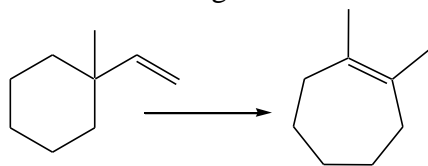
Ans: D

Topic: Bond Line Structure

Section: 2.2

Difficulty Level: Medium

29. For the following transformation how many H atoms are added or lost?



- A) Added one
- B) Added two
- C) Lost one
- D) Lost two
- E) No change

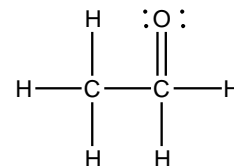
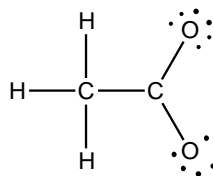
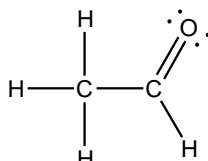
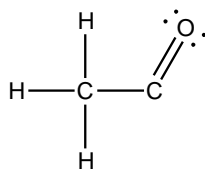
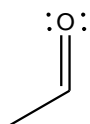
Ans: E

Topic: Bond Line Structure

Section: 2.2

Difficulty Level: Easy

30. Which of the following is the correct Lewis structure for the following compound?



- A) I
- B) II
- C) III
- D) IV
- E) None of these

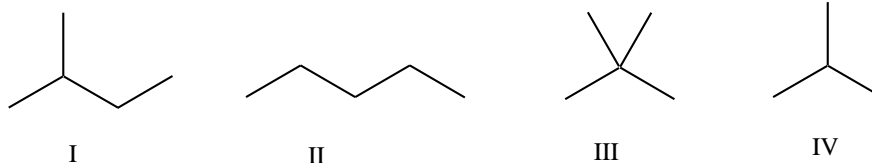
Ans: B

Topic: Bond Line Structure

Section: 2.2

Difficulty Level: Easy

31. Which of the following is the correct bond-line structure for  $(\text{CH}_3)_4\text{C}$ ?



- A) I
- B) II
- C) III
- D) IV
- E) None of these

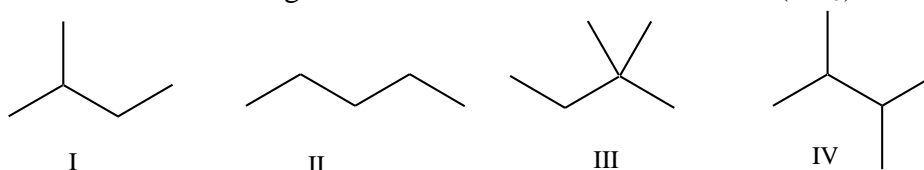
Ans: C

Topic: Bond Line Structure

Section: 2.2

Difficulty Level: Easy

32. Which of the following is the correct bond-line structure for  $(\text{CH}_3)_2\text{CHCH}_2\text{CH}_3$ ?



- A) I
- B) II
- C) III
- D) IV
- E) None of these

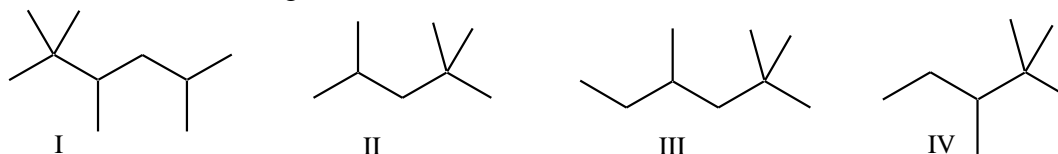
Ans: A

Topic: Bond Line Structure

Section: 2.2

Difficulty Level: Medium

33. Which of the following is the correct bond-line structure for  $(\text{CH}_3)_2\text{CHCH}_2\text{C}(\text{CH}_3)_3$ ?



- A) I
- B) II
- C) III
- D) IV
- E) None of these

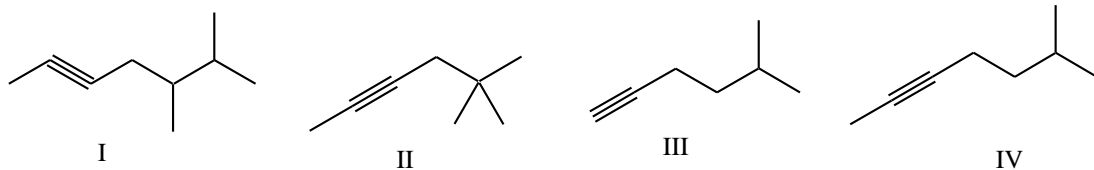
Ans: B

Topic: Bond Line Structure

Section: 2.2

Difficulty Level: Medium

34. Which of the following is the correct bond-line structure for  $\text{CH}_3\text{C}\equiv\text{C}(\text{CH}_2)_2\text{CH}(\text{CH}_3)_2$ ?



- A) I
- B) II
- C) III
- D) IV
- E) None of these

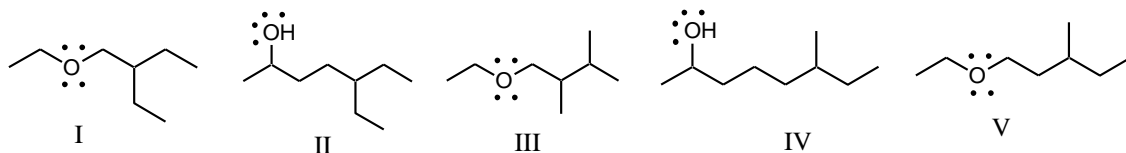
Ans: D

Topic: Bond Line Structure

Section: 2.2

Difficulty Level: Medium

35. Which of the following is the correct bond-line structure for  $\text{CH}_3\text{CHOH}(\text{CH}_2)_2\text{CH}(\text{CH}_2\text{CH}_3)_2$ ?



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

Ans: B

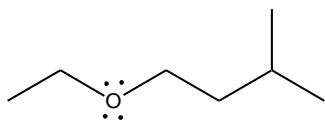
Topic: Bond Line Structure

Section: 2.2

Difficulty Level: Medium

36. Draw a bond-line structure for  $\text{CH}_3\text{CH}_2\text{O}(\text{CH}_2)_2\text{CH}(\text{CH}_3)_2$ .

Ans:

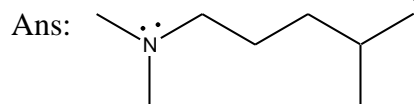


Topic: Bond Line Structure

Section: 2.2

Difficulty Level: Hard

37. Draw a bond-line structure for  $(\text{CH}_3)_2\text{N}(\text{CH}_2)_3\text{CH}(\text{CH}_3)_2$ .

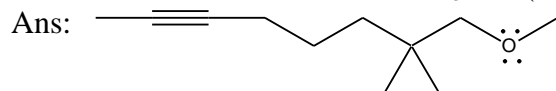


Topic: Bond Line Structure

Section: 2.2

Difficulty Level: Hard

38. Draw a bond-line structure for  $\text{CH}_3\text{C}\equiv\text{C}(\text{CH}_2)_3\text{C}(\text{CH}_3)_2\text{CH}_2\text{OCH}_3$ .



Topic: Bond Line Structure

Section: 2.2

Difficulty Level: Hard

39. Draw a bond-line structure for each constitutional isomer with a molecular formula of  $\text{C}_2\text{H}_4\text{O}$ .

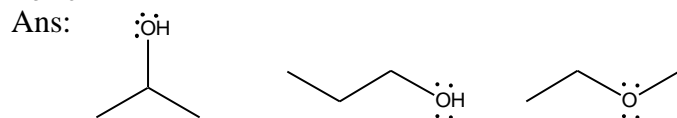


Topic: Bond Line Structure

Section: 2.2

Difficulty Level: Hard

40. Draw a bond-line structure for each constitutional isomer with a molecular formula of  $\text{C}_3\text{H}_8\text{O}$ .

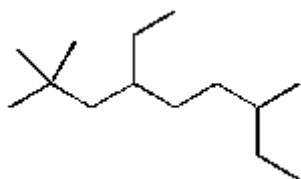


Topic: Bond Line Structure

Section: 2.2

Difficulty Level: Hard

41. Provide a condensed structure for the following compound.



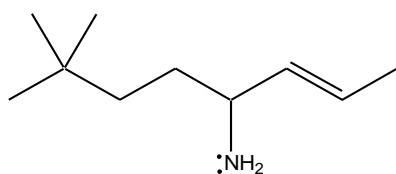
Ans:  $(\text{CH}_3)_3\text{CCH}_2\text{CH}(\text{CH}_2\text{CH}_3)(\text{CH}_2)_2\text{CH}(\text{CH}_3)\text{CH}_2\text{CH}_3$

Topic: Bond Line Structure

Section: 2.2

Difficulty Level: Hard

42. Provide a condensed structure for the following compound.



Ans:  $(\text{CH}_3)_3\text{C}(\text{CH}_2)_2\text{CH}(\text{NH}_2)\text{CH}=\text{CHCH}_3$

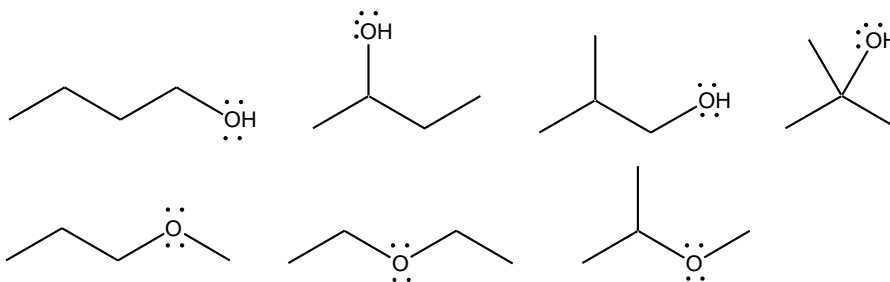
Topic: Bond Line Structure

Section: 2.2

Difficulty Level: Hard

43. Draw a bond-line structure for each constitutional isomer with molecular formula  $\text{C}_4\text{H}_{10}\text{O}$ .

Ans:



Topic: Bond Line Structure

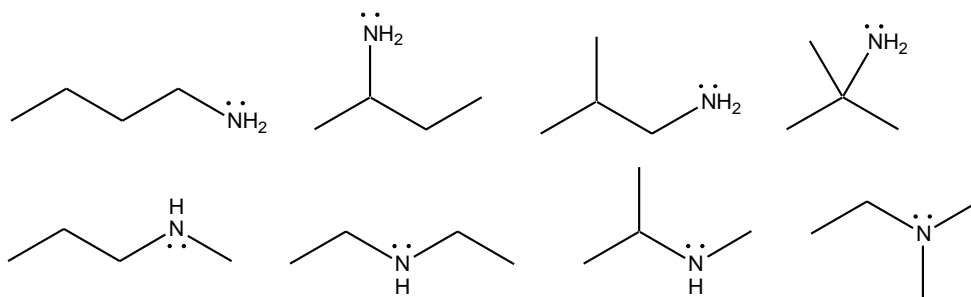
Section: 2.2

Difficulty Level: Hard



44. Draw a bond-line structure for each constitutional isomer with molecular formula  $C_4H_{11}N$ .

Ans:

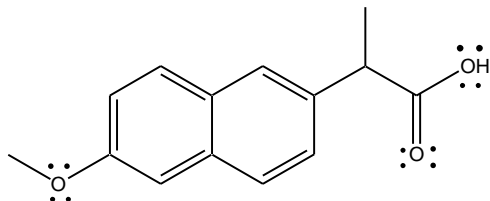


Topic: Bond Line Structure

Section: 2.2

Difficulty Level: Medium

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



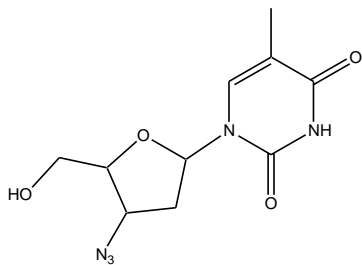
Ans:  $C_{14}H_{14}O_3$

Topic: Bond Line Structure

Section: 2.2

Difficulty Level: Hard

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



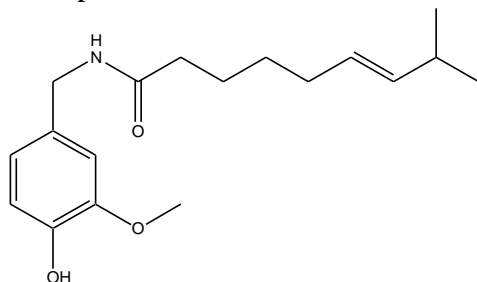
Ans:  $C_{10}H_{13}N_5O_4$

Topic: Bond Line Structure

Section: 2.2

Difficulty Level: Hard

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



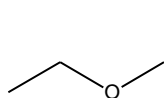
Ans: C<sub>18</sub>H<sub>27</sub>NO<sub>3</sub>

Topic: Identifying Functional Groups

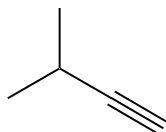
Section: 2.3

Difficulty Level: Easy

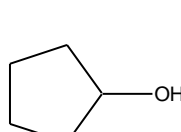
48. Which of the following compounds contain an alcohol functional group?



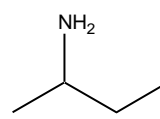
I



II



III



IV

- A) I
- B) II
- C) III
- D) IV
- E) None of these

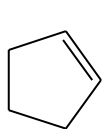
Ans: C

Topic: Identifying Functional Groups

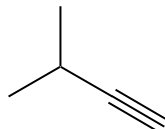
Section: 2.3

Difficulty Level: Easy

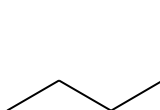
49. Which of the following compounds contain an alkene functional group?



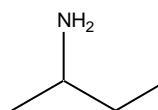
I



II



III



IV

- A) I
- B) II
- C) III
- D) IV
- E) None of these

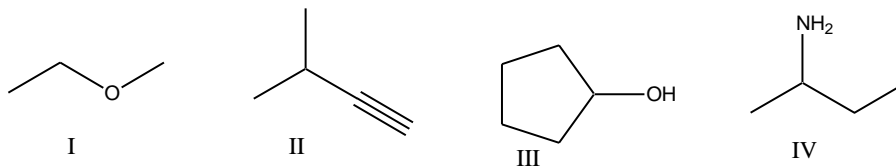
Ans: A

Topic: Identifying Functional Groups

Section: 2.3

Difficulty Level: Easy

50. Which of the following compounds contain an amine functional group?



- A) I
- B) II
- C) III
- D) IV
- E) None of these

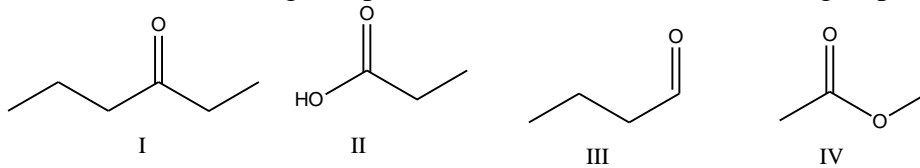
Ans: D

Topic: Identifying Functional Groups

Section: 2.3

Difficulty Level: Easy

51. Which of the following compounds contain a ketone functional group?



- A) I
- B) II
- C) III
- D) IV
- E) All of these

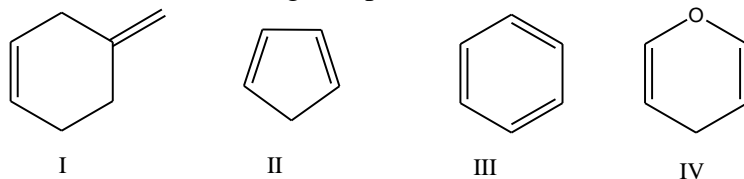
Ans: A

Topic: Identifying Functional Groups

Section: 2.3

Difficulty Level: Easy

52. Which of the following compounds contain an aromatic ring?



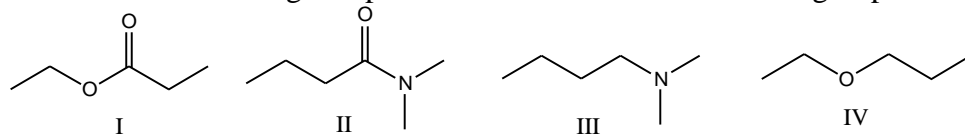
- A) I  
B) II  
C) III  
D) IV  
E) Both III & IV  
Ans: C

Topic: Identifying Functional Groups

Section: 2.3

Difficulty Level: Easy

53. Which of the following compounds contain an ester functional group?



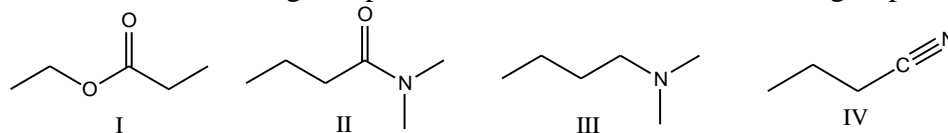
- A) I  
B) II  
C) III  
D) IV  
E) Both I & IV  
Ans: A

Topic: Identifying Functional Groups

Section: 2.3

Difficulty Level: Easy

54. Which of the following compounds contain an amide functional group?



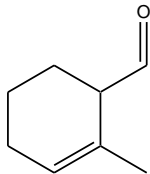
- A) I  
B) II  
C) III  
D) IV  
E) Both II & III  
Ans: B

Topic: Identifying Functional Groups

Section: 2.3

Difficulty Level: Medium

55. What functional group(s) is (are) present in the following compound?



- A) ketone & alkene
- B) ketone & alkyne
- C) aldehyde & alkene
- D) aldehyde & alkyne
- E) ester & alkene

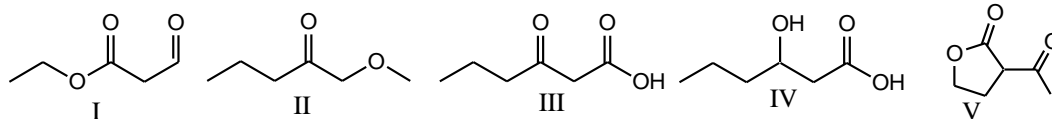
Ans: C

Topic: Identifying Functional Groups

Section: 2.3

Difficulty Level: Medium

56. Which of the following compounds have both a ketone and an ester functional group?



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

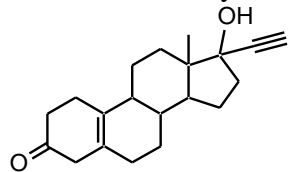
Ans: E

Topic: Identifying Functional Groups

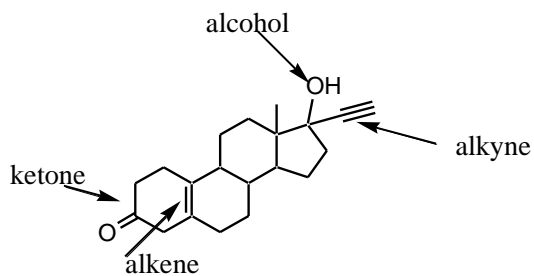
Section: 2.3

Difficulty Level: Medium

57. Norethynodrel, a component of the first combined oral contraceptive, has the following structure. Identify the functional groups in Norethynodrel.



Ans:

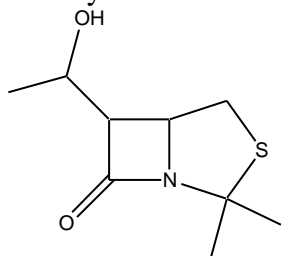


Topic: Identifying Functional Groups

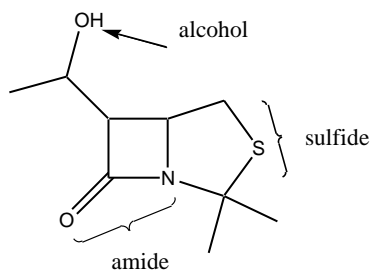
Section: 2.3

Difficulty Level: Medium

58. Identify the functional groups in the following compound.



Ans:

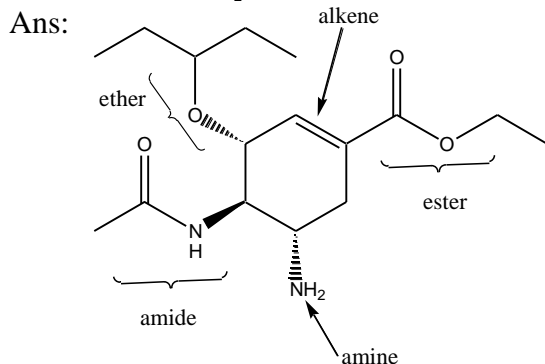
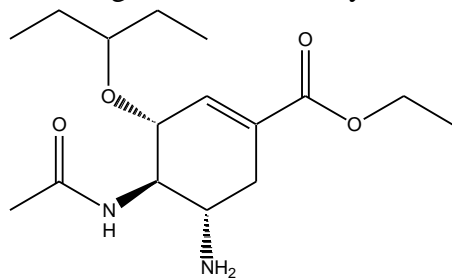


Topic: Identifying Functional Groups

Section: 2.3

Difficulty Level: Hard

59. Tamiflu<sup>®</sup>, is the most effective antiviral drug used to treat avian influenza, has the following structure. Identify the functional groups in Tamiflu<sup>®</sup>.

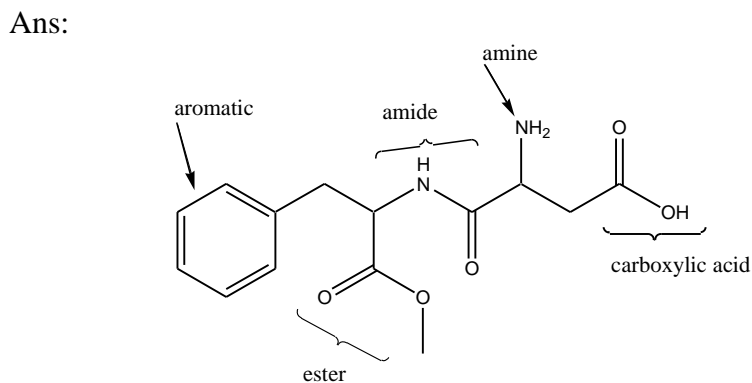
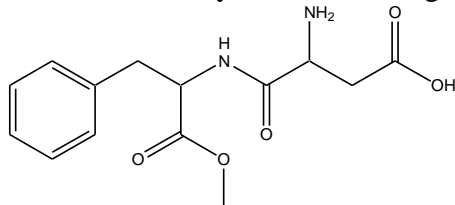


Topic: Identifying Functional Groups

Section: 2.3

Difficulty Level: Hard

60. Aspartame, an artificial sweetener used in Equal<sup>®</sup> and diet beverages, has the following structure. Identify the functional groups in Aspartame.



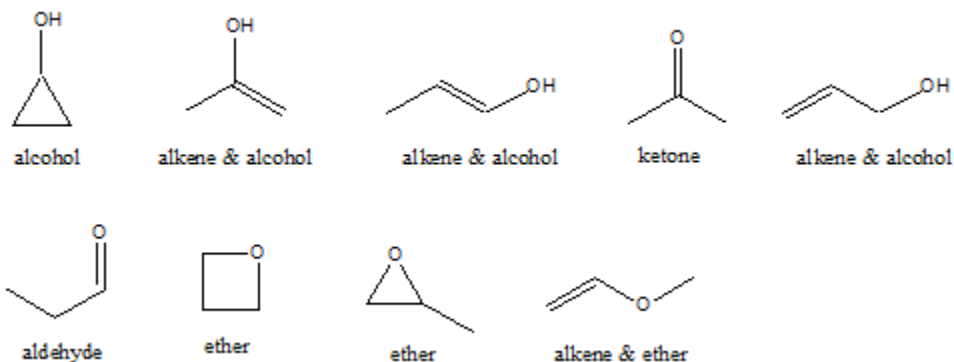
Topic: Identifying Functional Groups

Section: 2.3

Difficulty Level: Hard

61. Draw all the constitutional isomers with a molecular formula of  $C_3H_6O$  and label the functional groups in each isomer.

Ans:

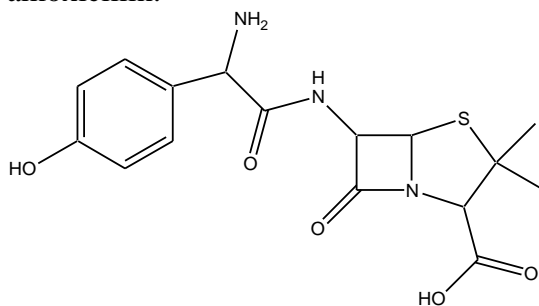


Topic: Identifying Functional Groups

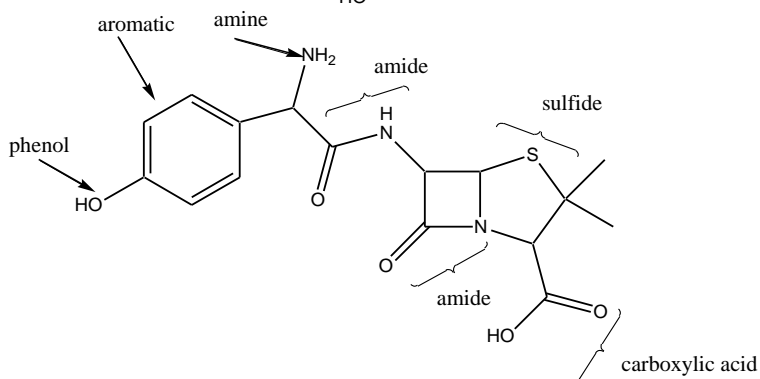
Section: 2.3

Difficulty Level: Hard

62. Amoxicillin, an antibiotic, has the following structure. Identify the functional groups in amoxicillin.



Ans:



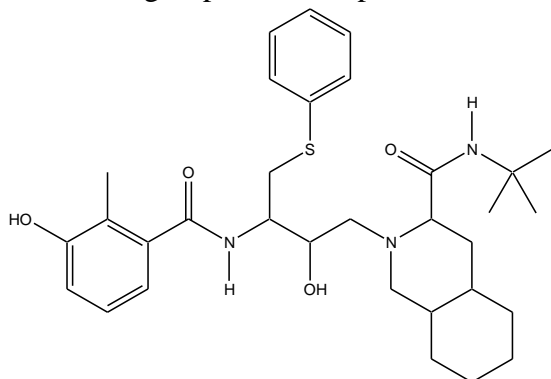
Topic: Identifying Functional Groups

Section: 2.3

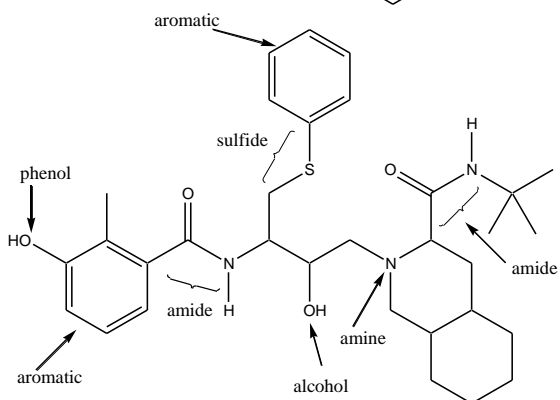
Difficulty Level: Hard



63. Viracept, used in the treatment of HIV, has the following structure. Identify the functional groups in Viracept.



Ans:

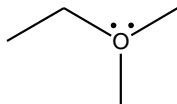


Topic: Carbon Atoms with Formal Charges

Section: 2.4

Difficulty Level: Easy

64. What is the formal charge on the oxygen atom in the following compound?



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

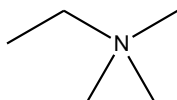
Ans: A

Topic: Carbon Atoms with Formal Charges

Section: 2.4

Difficulty Level: Easy

65. What is the formal charge on the nitrogen atom in the following compound?



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

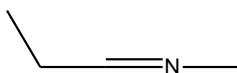
Ans: C

Topic: Carbon Atoms with Formal Charges

Section: 2.4

Difficulty Level: Easy

66. What is the formal charge on the nitrogen atom in the following compound?



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

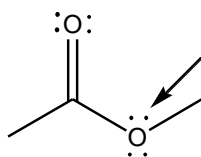
Ans: A

Topic: Carbon Atoms with Formal Charges

Section: 2.4

Difficulty Level: Easy

67. What is the formal charge on the indicated oxygen atom in the following compound?



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

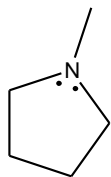
Ans: E

Topic: Carbon Atoms with Formal Charges

Section: 2.4

Difficulty Level: Easy

68. What is the formal charge on the nitrogen atom in the following compound?



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

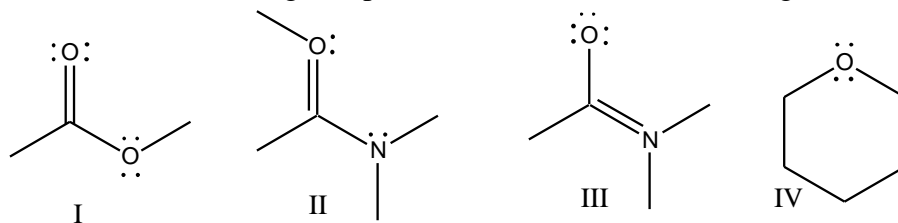
Ans: E

Topic: Carbon Atoms with Formal Charges

Section: 2.4

Difficulty Level: Medium

69. Which of the following compounds have +1 as a formal charge on an oxygen atom?



- A) I
- B) II
- C) III
- D) IV
- E) Both I & IV

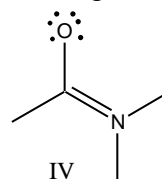
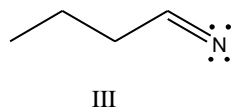
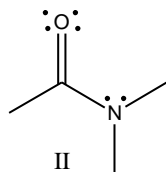
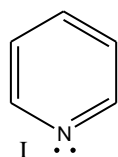
Ans: B

Topic: Carbon Atoms with Formal Charges

Section: 2.4

Difficulty Level: Medium

70. Which of the following compounds have +1 as a formal charge on the nitrogen atom?



- A) I  
 B) II  
 C) III  
 D) IV  
 E) Both I & II

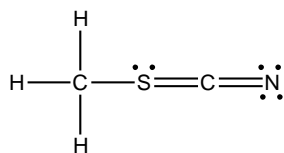
Ans: D

Topic: Carbon Atoms with Formal Charges

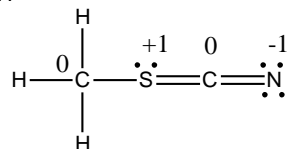
Section: 2.4

Difficulty Level: Medium

71. Determine the formal charges on each atom except hydrogen.



Ans:

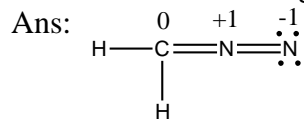


Topic: Carbon Atoms with Formal Charges

Section: 2.4

Difficulty Level: Hard

72. Diazomethane has the molecular formula  $\text{CH}_2\text{N}_2$ . Draw the preferred Lewis structure for diazomethane and assign formal charges to all atoms, if any.

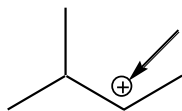


Topic: Carbon Atoms with Formal Charges

Section: 2.4

Difficulty Level: Easy

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



- A) one
- B) two
- C) three
- D) four
- E) none

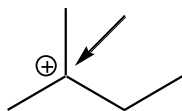
Ans: A

Topic: Carbon Atoms with Formal Charges

Section: 2.4

Difficulty Level: Easy

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



- A) one
- B) two
- C) three
- D) four
- E) none

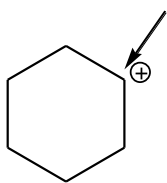
Ans: E

Topic: Carbon Atoms with Formal Charges

Section: 2.4

Difficulty Level: Easy

75. How many hydrogen atoms are connected to the indicated carbon atom?



- A) one
- B) two
- C) three
- D) four
- E) none

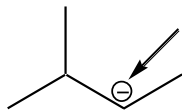
Ans: A

Topic: Carbon Atoms with Formal Charges

Section: 2.4

Difficulty Level: Easy

76. How many hydrogen atoms are connected to the indicated carbon atom?



- A) one
- B) two
- C) three
- D) four
- E) none

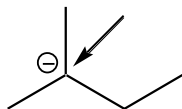
Ans: A

Topic: Carbon Atoms with Formal Charges

Section: 2.4

Difficulty Level: Easy

77. How many hydrogen atoms are connected to the indicated carbon atom?



- A) one
- B) two
- C) three
- D) four
- E) none

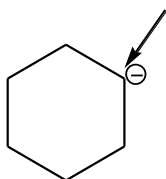
Ans: E

Topic: Carbon Atoms with Formal Charges

Section: 2.4

Difficulty Level: Easy

78. How many hydrogen atoms are connected to the indicated carbon atom?



- A) one
- B) two
- C) three
- D) four
- E) none

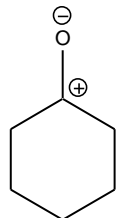
Ans: A

Topic: Carbon Atoms with Formal Charges

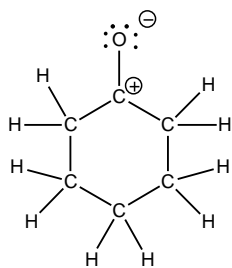
Section: 2.4

Difficulty Level: Medium

79. Draw Lewis structure for the following compound.



Ans:

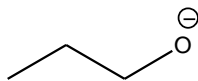


Topic: Identifying lone pairs

Section: 2.5

Difficulty Level: Easy

80. How many lone pairs of electrons are on the oxygen atom?



- A) one
- B) two
- C) three
- D) four
- E) none

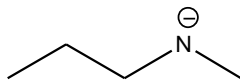
Ans: C

Topic: Identifying lone pairs

Section: 2.5

Difficulty Level: Easy

81. How many lone pairs of electrons are on the nitrogen atom?



- A) one
- B) two
- C) three
- D) four
- E) none

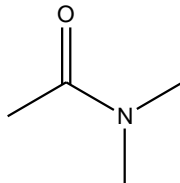
Ans: B

Topic: Identifying lone pairs

Section: 2.5

Difficulty Level: Easy

82. How many lone pairs of electrons are on the oxygen atom?



- A) one
- B) two
- C) three
- D) four
- E) none

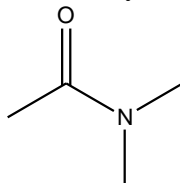
Ans: B

Topic: Identifying lone pairs

Section: 2.5

Difficulty Level: Easy

83. How many lone pairs of electrons are on the nitrogen atom?



- A) one
- B) two
- C) three
- D) four
- E) none

Ans: A

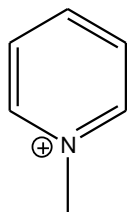
Topic: Identifying lone pairs

Section: 2.5

Difficulty Level: Easy



84. How many lone pairs of electrons are on the nitrogen atom?



- A) one
- B) two
- C) three
- D) four
- E) none

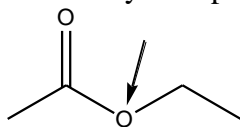
Ans: E

Topic: Identifying lone pairs

Section: 2.5

Difficulty Level: Easy

85. How many lone pairs of electrons are on the indicated oxygen atom?



- A) one
- B) two
- C) three
- D) four
- E) none

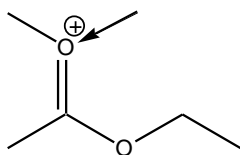
Ans: B

Topic: Identifying lone pairs

Section: 2.5

Difficulty Level: Easy

86. How many lone pairs of electrons are on the indicated oxygen atom?



- A) one
- B) two
- C) three
- D) four
- E) none

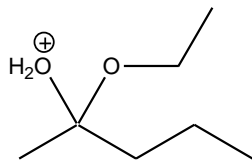
Ans: A

Topic: Identifying lone pairs

Section: 2.5

Difficulty Level: Medium

87. How many total lone pairs of electrons are on both oxygen atoms in the following compound?



- A) one
- B) two
- C) three
- D) four
- E) none

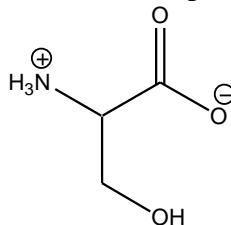
Ans: C

Topic: Identifying lone pairs

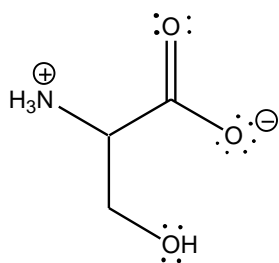
Section: 2.5

Difficulty Level: Medium

88. Draw all lone pairs of electrons for the following compound.



Ans:

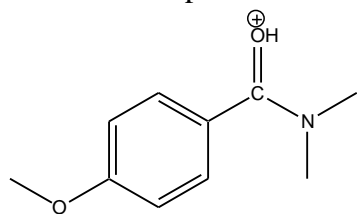


Topic: Identifying lone pairs

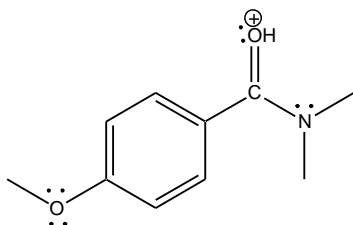
Section: 2.5

Difficulty Level: Medium

89. Draw all lone pairs of electrons for the following compound.



Ans:

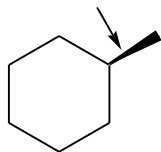


Topic: Three-Dimensional Bond-Line Structures

Section: 2.6

Difficulty Level: Easy

90. The indicated bond in the following compound is \_\_\_\_\_ of the paper.



- A) in the plane
- B) out of the plane
- C) behind the plane
- D) None of these

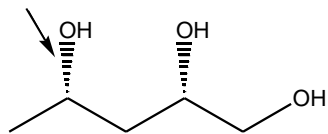
Ans: B

Topic: Three-Dimensional Bond-Line Structures

Section: 2.6

Difficulty Level: Easy

91. The indicated bond in the following compound is \_\_\_\_\_ of the paper.



- A) in the plane
- B) out of the plane
- C) behind the plane
- D) None of these

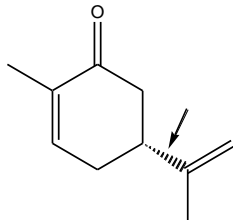
Ans: C

Topic: Three-Dimensional Bond-Line Structures

Section: 2.6

Difficulty Level: Easy

92. The indicated bond in the following compound is \_\_\_\_\_ of the paper.



- A) in the plane
- B) out of the plane
- C) behind the plane
- D) None of these

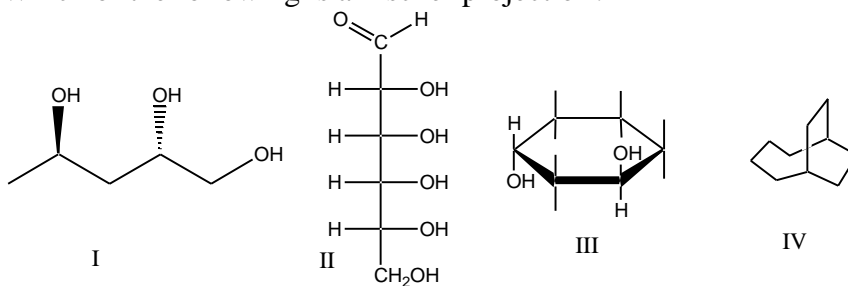
Ans: C

Topic: Three-Dimensional Bond-Line Structures

Section: 2.6

Difficulty Level: Easy

93. Which of the following is a Fischer projection?



- A) I
- B) II
- C) III
- D) IV
- E) Both III & IV

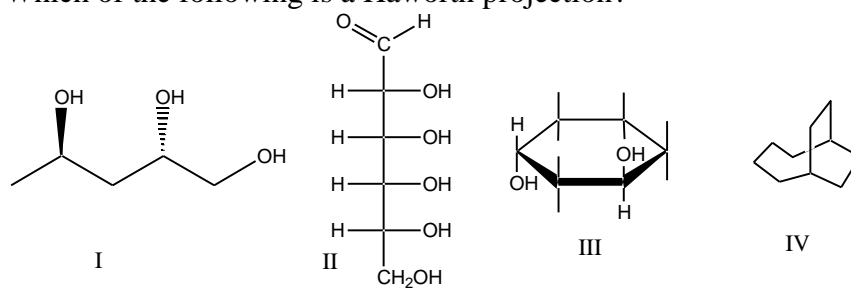
Ans: B

Topic: Three-Dimensional Bond-Line Structures

Section: 2.6

Difficulty Level: Easy

94. Which of the following is a Haworth projection?



- A) I
- B) II
- C) III
- D) IV
- E) Both III & IV

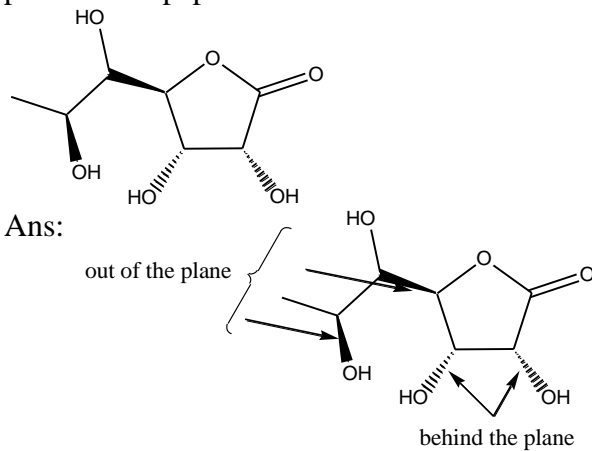
Ans: C

Topic: Three-Dimensional Bond-Line Structures

Section: 2.6

Difficulty Level: Medium

95. For the following compound label the bonds that are out of the plane and behind the plane of the paper.



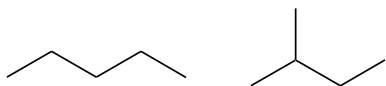
Topic: Introduction to Resonance

Section: 2.7

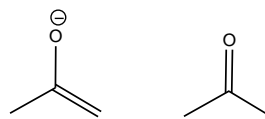
Difficulty Level: Easy

96. Which of the following pairs are resonance structures of each other?

I.



II.



III.



IV.



- A) I
- B) II
- C) III
- D) IV
- E) None of these

Ans: D

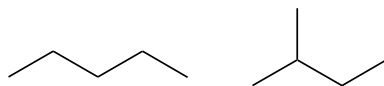
Topic: Introduction to Resonance

Section: 2.7

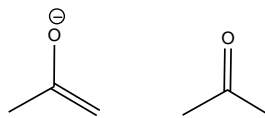
Difficulty Level: Easy

97. Which of the following pairs are resonance structures of each other?

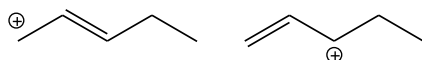
I.



II.



III.



IV.



- A) I
- B) II
- C) III
- D) IV
- E) None of these

Ans: C

Topic: Introduction to Resonance

Section: 2.7

Difficulty Level: Easy

98. Spreading of positive or negative charge over two or more atoms in a compound is called\_\_\_\_\_.

- A) isomerism
- B) delocalization
- C) stereoisomerism
- D) localization
- E) None of these

Ans: B

Topic: Introduction to Resonance

Section: 2.7

Difficulty Level: Easy

99. Delocalization of charge over two or more atoms \_\_\_\_\_ a molecule.

- A) destabilizes
- B) delocalizes
- C) localizes
- D) stabilizes
- E) None of these

Ans: D

Topic: Introduction to Resonance

Section: 2.7

Difficulty Level: Medium

100. Resonance structures have \_\_\_\_\_ connectivity of atoms and \_\_\_\_\_ distribution of electrons.

- A) different, same
- B) same, same
- C) different, different
- D) same, different
- E) None of these

Ans: D

Topic: Introduction to Resonance

Section: 2.7

Difficulty Level: Medium

101. What is a resonance hybrid?

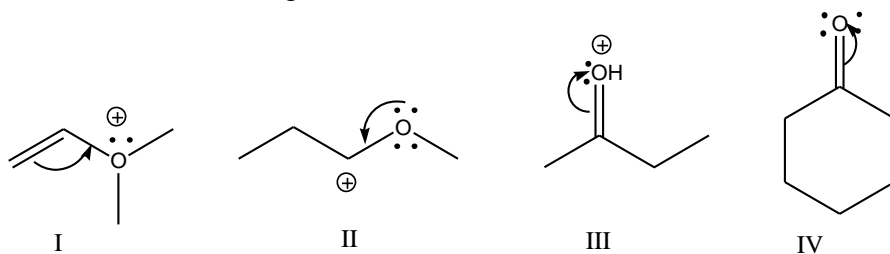
Ans: A molecule that can be represented by drawing two or more resonance structures is viewed as resonance hybrid.

Topic: Curved Arrows

Section: 2.8

Difficulty Level: Easy

102. Which of the following violates the rules for curved arrows?



- A) I
- B) II
- C) III
- D) IV
- E) None of these

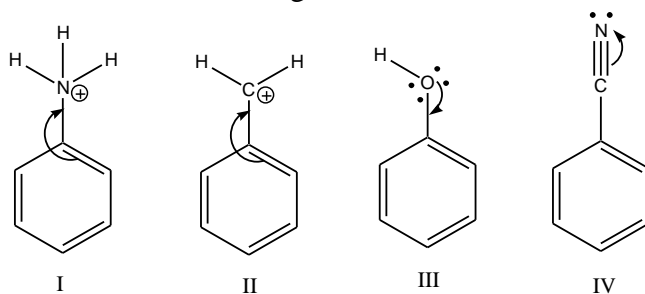
Ans: A

Topic: Curved Arrows

Section: 2.8

Difficulty Level: Easy

103. Which of the following violates the rules for curved arrows?



- A) I
- B) II & IV
- C) I & III
- D) III & IV
- E) None of these

Ans: C

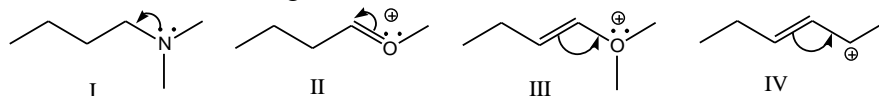
Topic: Curved Arrows

Section: 2.8

Difficulty Level: Easy



104. Which of the following violates the rules for curved arrows?



- A) I & II
- B) III & IV
- C) I, II & III
- D) II, III & IV
- E) All of these

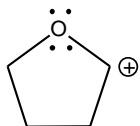
Ans: C

Topic: Curved Arrows

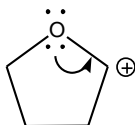
Section: 2.8

Difficulty Level: Medium

105. Provide the curved arrow(s) to draw a resonance structure for the following compound.



Ans:

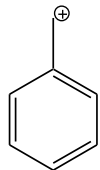


Topic: Curved Arrows

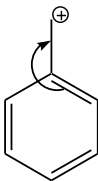
Section: 2.8

Difficulty Level: Medium

106. Provide the curved arrow(s) to draw a resonance structure for the following compound.



Ans:

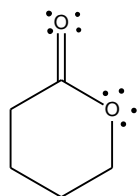


Topic: Curved Arrows

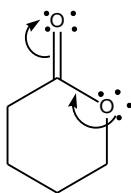
Section: 2.8

Difficulty Level: Hard

107. Provide the curved arrow(s) to draw a resonance structure for the following compound.



Ans:

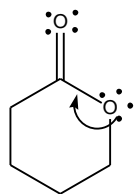


Topic: Curved Arrows

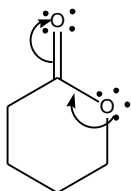
Section: 2.8

Difficulty Level: Hard

108. Explain using words as well as structural drawings, if the single curved arrow shown is sufficient to draw the resonance structure.



Ans: The single arrow shown will violate the octet rule. Drawing another curved arrow will remove the violation.

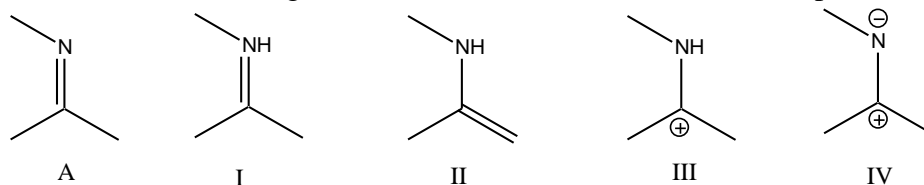


Topic: Formal Charges in Resonance Structures

Section: 2.9

Difficulty Level: Easy

109. Which of the following is a correct resonance structure for compound A?



- A) I
- B) II
- C) III
- D) IV
- E) none of these

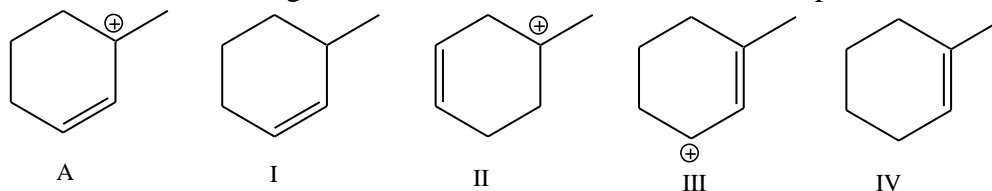
Ans: D

Topic: Formal Charges in Resonance Structures

Section: 2.9

Difficulty Level: Easy

110. Which of the following is a correct resonance structure for compound A?



- A) I
- B) II
- C) III
- D) IV
- E) None of these

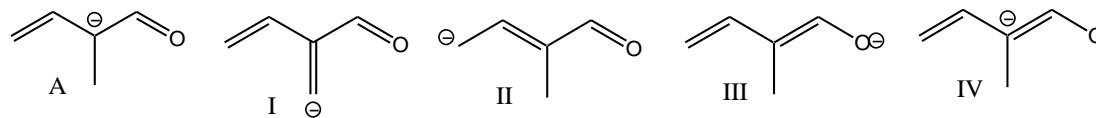
Ans: C

Topic: Formal Charges in Resonance Structures

Section: 2.9

Difficulty Level: Medium

111. Which of the following is/are correct resonance structure(s) for compound A?



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

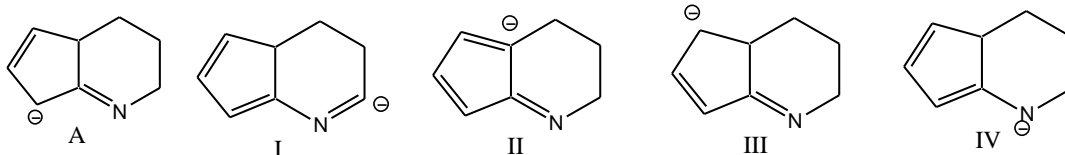
Ans: B

Topic: Formal Charges in Resonance Structures

Section: 2.9

Difficulty Level: Medium

112. Which of the following is/are correct resonance structure(s) for compound A



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

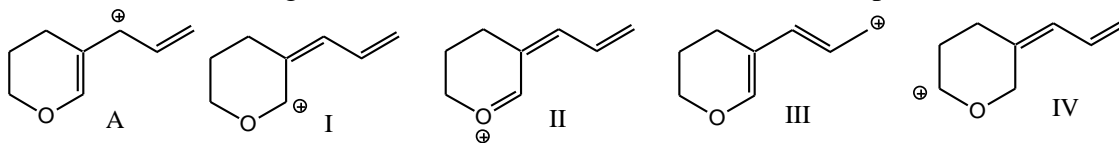
Ans: C

Topic: Formal Charges in Resonance Structures

Section: 2.9

Difficulty Level: Medium

113. Which of the following is/are correct resonance structure(s) for compound A?



- A) I & II
- B) II & III
- C) III & IV
- D) I, II & III
- E) I & IV

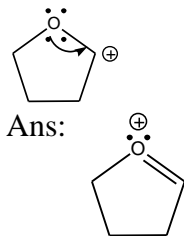
Ans: D

Topic: Formal Charges in Resonance Structures

Section: 2.9

Difficulty Level: Easy

114. Draw the resonance structure indicated by the curved arrows.

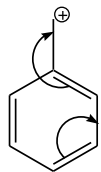


Topic: Formal Charges in Resonance Structures

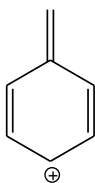
Section: 2.9

Difficulty Level: Easy

115. Draw the resonance structure indicated by the curved arrows.



Ans:

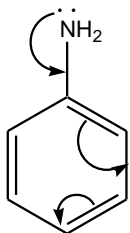


Topic: Formal Charges in Resonance Structures

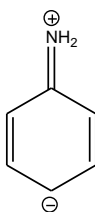
Section: 2.9

Difficulty Level: Medium

116. Draw the resonance structure indicated by the curved arrows.



Ans:

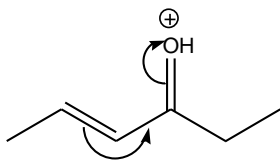


Topic: Formal Charges in Resonance Structures

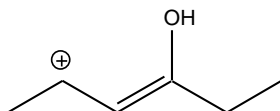
Section: 2.9

Difficulty Level: Medium

117. Draw the resonance structure indicated by the curved arrows.



Ans:

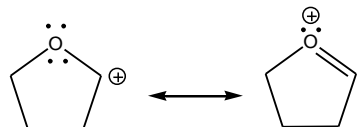


Topic: Formal Charges in Resonance Structures

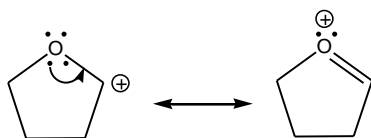
Section: 2.9

Difficulty Level: Medium

118. Draw the curved arrow(s) for converting the first resonance structure into the second resonance structure.



Ans:

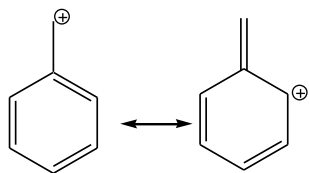


Topic: Formal Charges in Resonance Structures

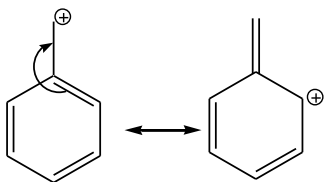
Section: 2.9

Difficulty Level: Medium

119. Draw the curved arrow(s) for converting the first resonance structure into the second resonance structure.



Ans:

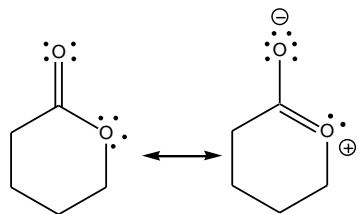


Topic: Formal Charges in Resonance Structures

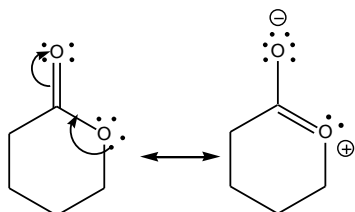
Section: 2.9

Difficulty Level: Hard

120. Draw the curved arrow(s) for converting the first resonance structure into the second resonance structure.



Ans:

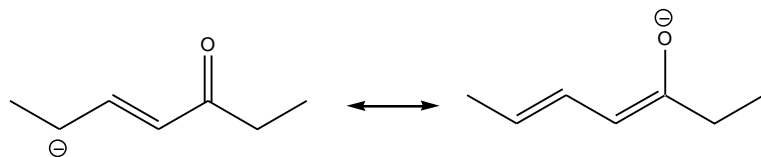


Topic: Formal Charges in Resonance Structures

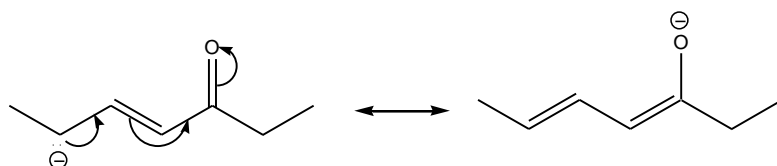
Section: 2.9

Difficulty Level: Hard

121. Draw the curved arrow(s) for converting the first resonance structure into the second resonance structure.



Ans:

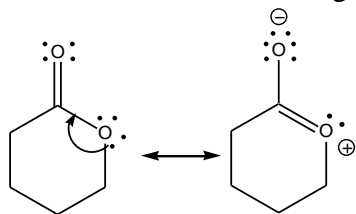


Topic: Formal Charges in Resonance Structures

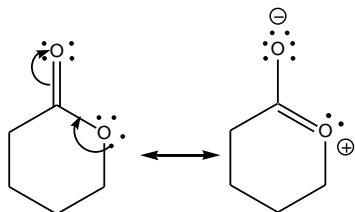
Section: 2.9

Difficulty Level: Hard

122. Explain using words as well as structural drawings, if the single curved arrow shown is sufficient for the following resonance structures?



Ans: The single arrow shown will violate the octet rule. Drawing another curved arrow will remove the violation.

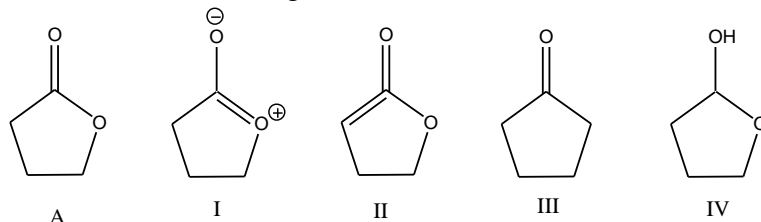


Topic: Pattern Recognition

Section: 2.10

Difficulty Level: Easy

123. Which of the following is a correct resonance structure for compound A



- A) I
- B) II
- C) III
- D) IV
- E) None of these

Ans: A

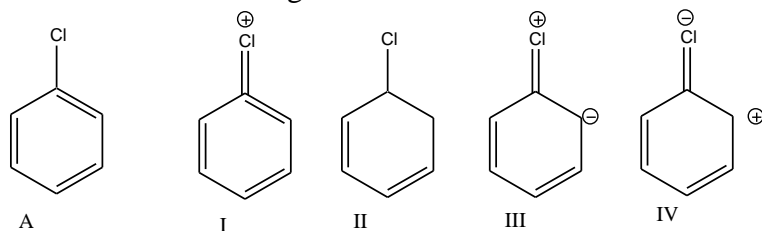
Topic: Pattern Recognition

Section: 2.10

Difficulty Level: Easy



124. Which of the following is a correct resonance structure for compound A?



- A) I
- B) II
- C) III
- D) IV
- E) None of these

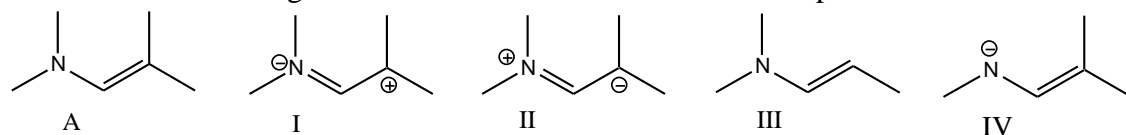
Ans: C

Topic: Pattern Recognition

Section: 2.10

Difficulty Level: Easy

125. Which of the following is a correct resonance structure for compound A?



- A) I
- B) II
- C) III
- D) IV
- E) None of these

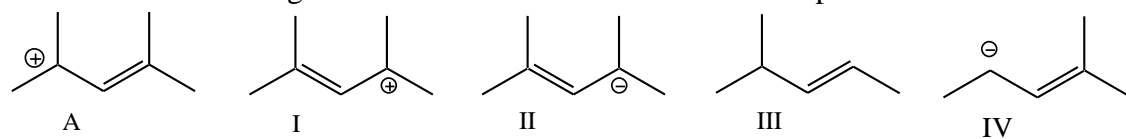
Ans: B

Topic: Pattern Recognition

Section: 2.10

Difficulty Level: Easy

126. Which of the following is a correct resonance structure for compound A?



- A) I
- B) II
- C) III
- D) IV
- E) None of these

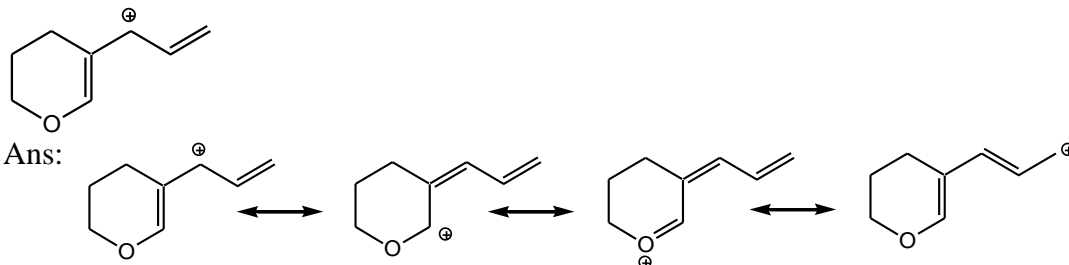
Ans: A

Topic: Pattern Recognition

Section: 2.10

Difficulty Level: Medium

127. Draw resonance structures for the following compound.

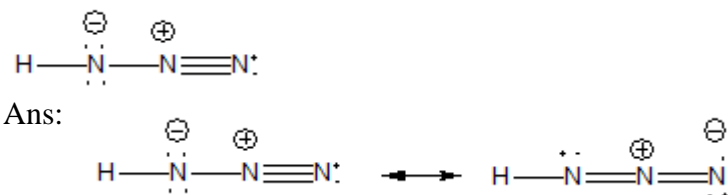


Topic: Pattern Recognition

Section: 2.10

Difficulty Level: Hard

128. Draw two additional resonance structures for the following compound.

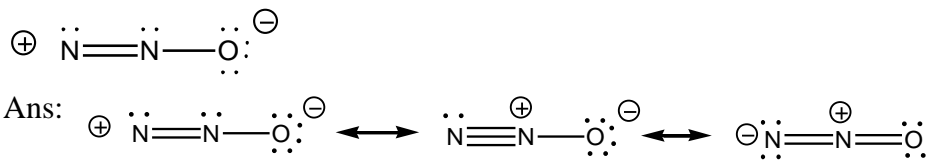


Topic: Pattern Recognition

Section: 2.10

Difficulty Level: Hard

129. Draw two additional resonance structures for the following compound.

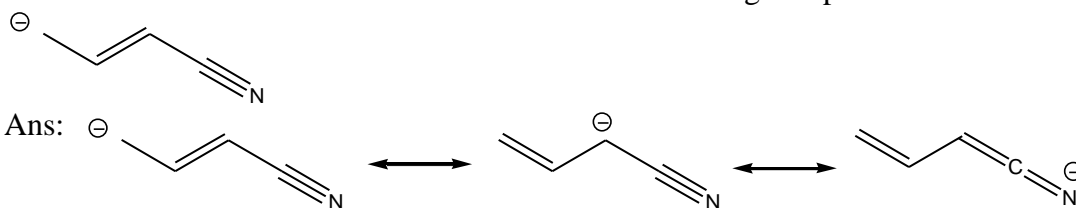


Topic: Pattern Recognition

Section: 2.10

Difficulty Level: Hard

130. Draw two additional resonance structures for the following compound.

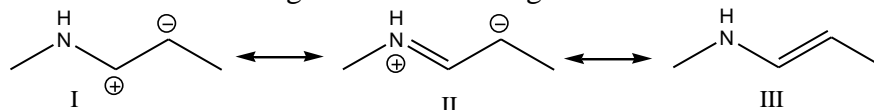


Topic: Assessing Importance

Section: 2.11

Difficulty Level: Easy

131. Which of the following is/are the most significant resonance structure(s)?



- A) I
- B) II
- C) III
- D) II & III
- E) all of these

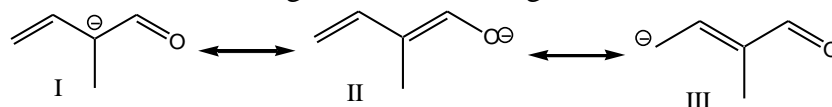
Ans: C

Topic: Assessing Importance

Section: 2.11

Difficulty Level: Easy

132. Which of the following is/are the most significant resonance structure(s)?



- A) I
- B) II
- C) III
- D) I & II
- E) all of these

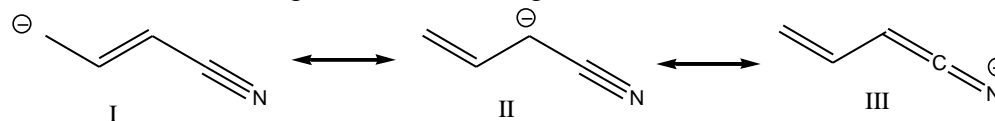
Ans: B

Topic: Assessing Importance

Section: 2.11

Difficulty Level: Easy

133. Which of the following is/are the most significant resonance structure(s)?



- A) I
- B) II
- C) III
- D) I & II
- E) all of these

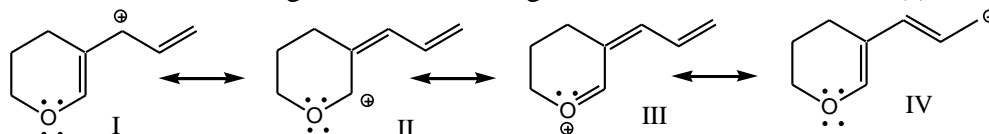
Ans: C

Topic: Assessing Importance

Section: 2.11

Difficulty Level: Medium

134. Which of the following is/are the most significant resonance structure(s)?



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

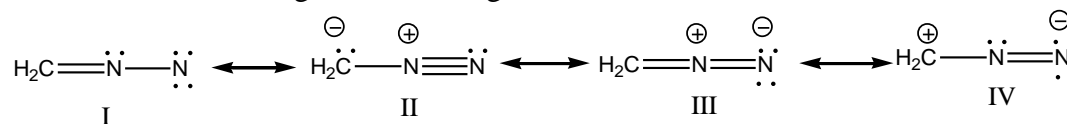
Ans: C

Topic: Assessing Importance

Section: 2.11

Difficulty Level: Medium

135. Which of the following is the most significant resonance structure?



- A) I
- B) II
- C) III
- D) IV
- E) None of these

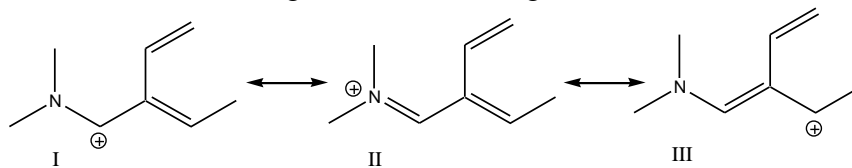
Ans: C

Topic: Assessing Importance

Section: 2.11

Difficulty Level: Medium

136. Which of the following is/are the most significant resonance structure(s)?



- A) I  
 B) II  
 C) III  
 D) I & III  
 E) all of these

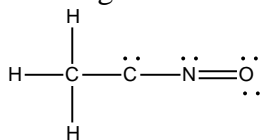
Ans: B

Topic: Assessing Importance

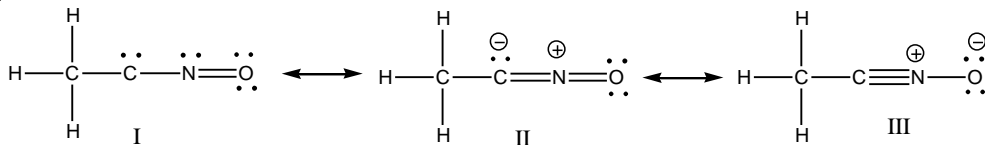
Section: 2.11

Difficulty Level: Hard

137. Draw significant resonance structures for the following compound. Which of this is/are most significant resonance structure(s)? Explain why.



Ans:



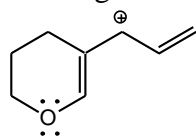
Resonance structure III is most significant, because the more electronegative oxygen atom carries a negative formal charge.

Topic: Assessing Importance

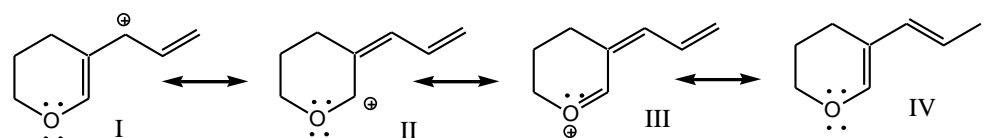
Section: 2.11

Difficulty Level: Hard

138. Draw significant resonance structures for the following compound. Which of this is/are most significant resonance structure(s)? Explain why.



Ans:



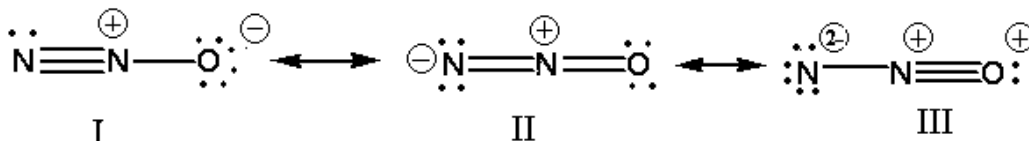
Resonance structure III is most significant, because all atoms have octet of electrons.

Topic: Assessing Importance  
Section: 2.11  
Difficulty Level: Hard

139. Draw significant resonance structures for the following compound. Which of this is/are most significant resonance structure(s)? Explain why.



Ans:



Resonance structure I is most significant, because the more electronegative oxygen atom carries a negative formal charge.

Topic: Assessing Importance  
Section: 2.11  
Difficulty Level: Easy

140. What is the relationship between the following compounds?



- A) Constitutional isomers
- B) Resonance structures
- C) conformers
- D) Identical compounds

Ans: B

Topic: Assessing Importance  
Section: 2.11  
Difficulty Level: Easy

141. What is the relationship between the following compounds?

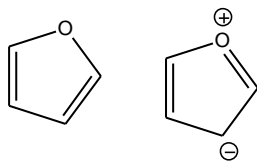


- A) Constitutional isomers
- B) Resonance structures
- C) conformers
- D) Identical compounds
- E) Different compounds

Ans: A

Topic: Assessing Importance  
Section: 2.11  
Difficulty Level: Easy

142. What is the relationship between the following compounds?



- A) Constitutional isomers
- B) Resonance structures
- C) conformers
- D) Identical compounds
- E) Different compounds

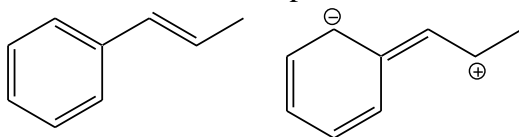
Ans: B

Topic: Assessing Importance

Section: 2.11

Difficulty Level: Easy

143. What is the relationship between the following compounds?



- A) Constitutional isomers
- B) Resonance structures
- C) conformers
- D) Identical compounds
- E) Different compounds

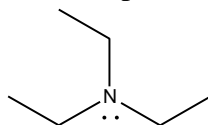
Ans: B

Topic: Delocalized and Localized Lone Pairs

Section: 2.12

Difficulty Level: Easy

144. The lone pair on nitrogen in the following compound is \_\_\_\_\_.



- A) localized
- B) delocalized

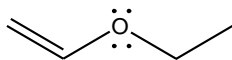
Ans: A

Topic: Delocalized and Localized Lone Pairs

Section: 2.12

Difficulty Level: Easy

145. The lone pair on oxygen in the following compound is \_\_\_\_\_.



- A) localized
- B) delocalized

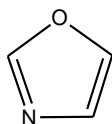
Ans: B

Topic: Delocalized and Localized Lone Pairs

Section: 2.12

Difficulty Level: Easy

146. The lone pair on nitrogen in the following compound is \_\_\_\_\_.



- A) localized
- B) delocalized

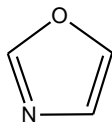
Ans: A

Topic: Delocalized and Localized Lone Pairs

Section: 2.12

Difficulty Level: Easy

147. The lone pairs on oxygen in the following compound are \_\_\_\_\_.



- A) both localized
- B) both delocalized
- C) one localized
- D) one delocalized
- E) Both C & D

Ans: E

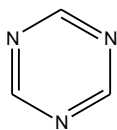
Topic: Delocalized and Localized Lone Pairs

Section: 2.12

Difficulty Level: Easy



148. The lone pair on nitrogen in the following compound is \_\_\_\_\_.



- A) localized
- B) delocalized

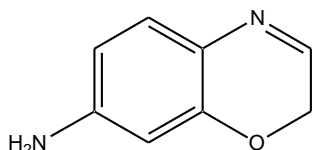
Ans: A

Topic: Delocalized and Localized Lone Pairs

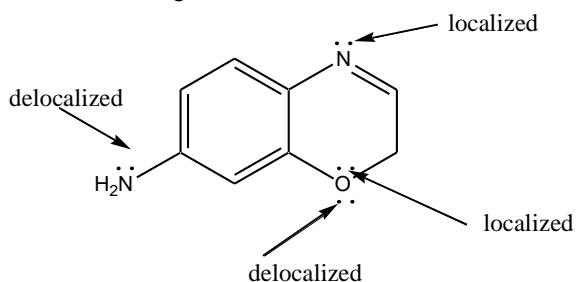
Section: 2.12

Difficulty Level: Medium

149. For the following compound identify the lone pairs and indicate if each lone pair is localized or delocalized.



Ans:

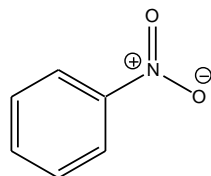


Topic: Delocalized and Localized Lone Pairs

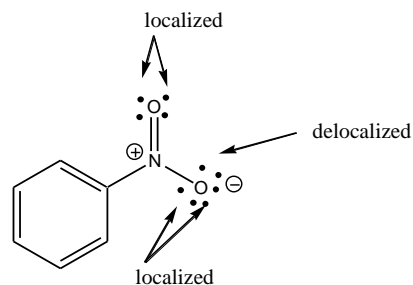
Section: 2.12

Difficulty Level: Medium

150. For the following compound identify the lone pairs and indicate if each lone pair is localized or delocalized.



Ans:

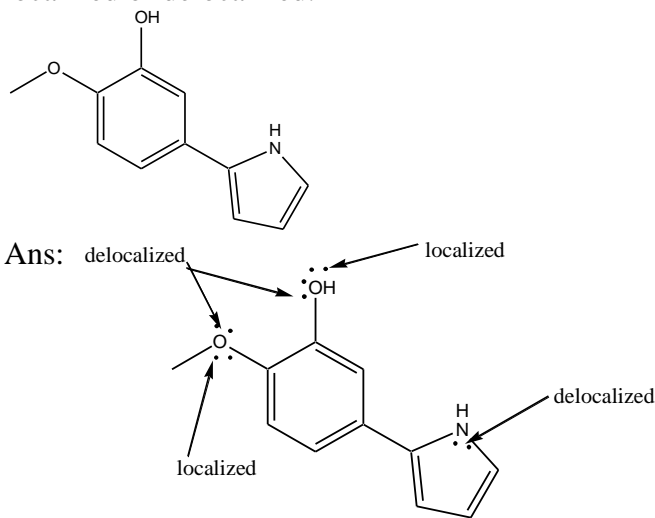


Topic: Delocalized and Localized Lone Pairs

Section: 2.12

Difficulty Level: Medium

151. For the following compound identify the lone pairs and indicate if each lone pair is localized or delocalized.

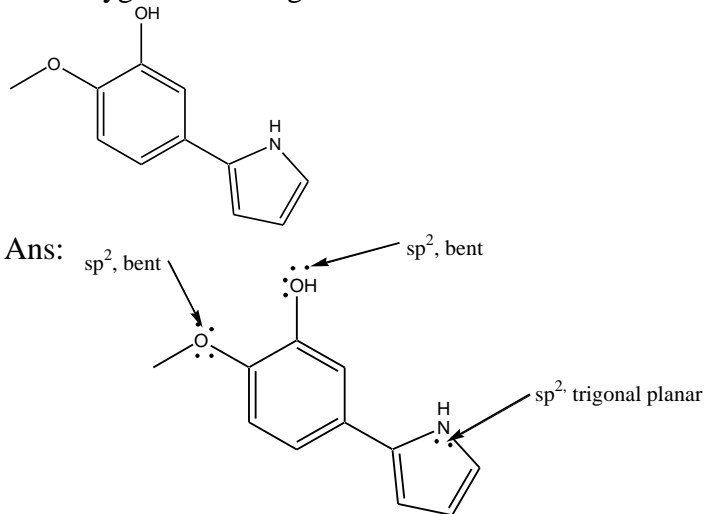


Topic: Delocalized and Localized Lone Pairs

Section: 2.12

Difficulty Level: Hard

152. For the following compound what is the hybridization state and molecular geometry at each oxygen and nitrogen atom

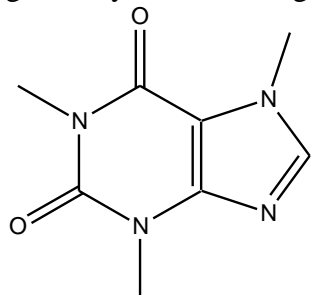


Topic: Delocalized and Localized Lone Pairs

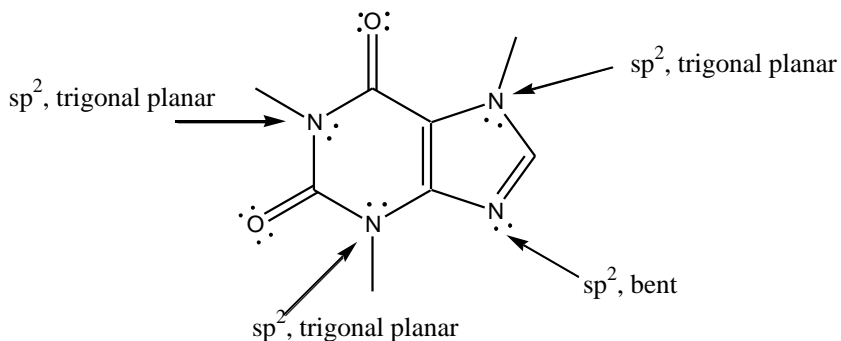
Section: 2.12

Difficulty Level: Hard

153. Caffeine has the following structure. What is the hybridization state and molecular geometry at each nitrogen atom in Caffeine?



Ans:

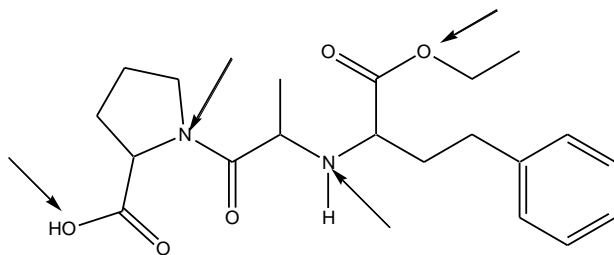


Topic: Delocalized and Localized Lone Pairs

Section: 2.12

Difficulty Level: Hard

154. Enalapril, is a drug used in the treatment of heart disease. What is the hybridization state and molecular geometry at the indicated atoms in enalapril?



Ans:

