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# Test Bank for Organic Chemistry 8th Edition by Wade

Organic Chemistry 8th Edition Test Bank – Wade

Sample

*Organic Chemistry, 8e (Wade)*

## Chapter 7 Structure and Synthesis of Alkenes

1) Which of the following statements best describes the relative bond dissociation energies of the sigma and pi bonds present in the carbon-carbon double bond of an alkene?

1. A)  $\sigma > \pi$
2. B)  $\pi > \sigma$
3. C)  $\sigma = \pi$
4. D) cannot be estimated

Answer: A

Diff: 2

Section: 7.1

2) The carbon-carbon bond length in ethylene is \_\_\_\_\_ than the carbon-carbon bond length in ethane, and the HCH bond angle in ethylene is \_\_\_\_\_ the HCH bond angle in ethane

1. A) shorter; smaller than
2. B) shorter; larger than
3. C) longer; smaller than

4. D) longer; larger than
5. E) longer; the same as

Answer: B

Diff: 1

Section: 7.2

3) Carbon-carbon single bonds tend to be \_\_\_\_\_ and \_\_\_\_\_ than carbon-carbon double bonds.

1. A) shorter, stronger
2. B) longer, stronger
3. C) shorter, weaker
4. D) longer, weaker

Answer: D

Diff: 1

Section: 7.2

4) Which of the following best approximates the CCC bond angle of propene?

1. A)  $90^\circ$
2. B)  $109^\circ$
3. C)  $120^\circ$
4. D)  $150^\circ$
5. E)  $180^\circ$

Answer: C

Diff: 1

Section: 7.2

5) Circle all atoms that are coplanar in the molecule below.

Answer:

Diff: 2

Section: 7.2

6) Draw the line energy orbital diagram for the outer shell of an  $sp^2$  hybridized carbon atom and explain how a carbon/carbon double is formed.

Answer:

If we follow Hund's rule and fill each orbital with one electron and then promote one to the lone atomic p orbital, there are single electrons in the three  $sp$  hybrid orbitals that can form sigma overlaps with 2-H orbitals and one other  $sp^2$  hybridized carbon orbital. The atomic p orbital with one electron can then form a pi bond by a side to side overlap with the other p orbital from the other  $sp^2$  hybridized carbon atom.

Diff: 2

Section: 7.2

7) Why is rotation about the carbon-carbon double bond in alkenes prohibited while relatively free rotation can occur about the carbon-carbon single bond in alkanes?

Answer: Rotation about the C-C single bond in alkanes can occur without breaking the bond or disrupting the orbital overlap. For rotation to occur about a C=C, the  $\pi$  bond would have to be broken since the p orbital overlap from which the bond is formed is disrupted by rotation.

Diff: 2

Section: 7.2

8) What two atomic orbitals or hybrid atomic orbitals overlap to form the C-H bond in ethylene?

1. A) C  $sp^3$  + H s
2. B) C  $sp^2$  + H s
3. C) C sp + H s
4. D) C p + H s

Answer: B

Diff: 3

Section: 7.2

9) What two atomic orbitals or hybrid atomic orbitals overlap to form the C-C  $\sigma$  bond in ethylene?

1. A) C  $sp^3$  + C  $sp^3$
2. B) C  $sp^3$  + C  $sp^2$
3. C) C  $sp^2$  + C  $sp^2$
4. D) C  $sp^3$  + C p
5. E) C  $sp^2$  + C p

Answer: C

Diff: 3

Section: 7.2

10) What two atomic orbitals or hybrid atomic orbitals overlap to form the C-C  $\pi$  bond in ethylene?

1. A) C sp<sup>3</sup>+ C sp<sup>3</sup>
2. B) C sp<sup>3</sup>+ C sp<sup>2</sup>
3. C) C sp<sup>2</sup>+ C sp<sup>2</sup>
4. D) C sp<sup>2</sup>+ C p
5. E) C p + C p

Answer: E

Diff: 3

Section: 7.2

11) Consider molecules with the formula C<sub>10</sub>H<sub>16</sub>. Which of the following structural features are *not* possible within this set of molecules?

1. A) 2 triple bonds
2. B) 1 ring and 1 triple bond
3. C) 2 rings and 1 double bond
4. D) 2 double bonds and 1 ring
5. E) 3 double bonds

Answer: A

Diff: 1

Section: 7.3

12) How many elements of unsaturation are implied by the molecular formula C<sub>6</sub>H<sub>12</sub>?

1. A) 0
2. B) 1
3. C) 2

4. D) 3
5. E) 4

Answer: B

Diff: 1

Section: 7.3

13) How many elements of unsaturation do molecules with a molecular formula of  $C_6H_6Cl_6$  have?

1. A) 0
2. B) 1
3. C) 2
4. D) 3
5. E) 4

Answer: B

Diff: 1

Section: 7.3

14) How many elements of unsaturation do molecules with a molecular formula of  $C_8H_4N_2$  have?

1. A) 2
2. B) 4
3. C) 6
4. D) 8
5. E) 10

Answer: D

Diff: 1

Section: 7.3

15) Which of the following molecular formulas corresponds to a monocyclic saturated compound?

1. A)  $C_6H_6$
2. B)  $C_3H_7Br$
3. C)  $C_3H_7N$
4. D)  $C_3H_8O$

Answer: C

Diff: 2

Section: 7.3

16) How many elements of unsaturation are implied by the molecular formula  $C_5H_8O$ ?

1. A) 0
2. B) 1
3. C) 2
4. D) 3
5. E) 4

Answer: C

Diff: 2

Section: 7.3

17) How many elements of unsaturation are implied by the molecular formula  $C_7H_{11}Cl$ ?

1. A) 0

2. B) 1
3. C) 2
4. D) 3
  
5. E) 4

Answer: C

Diff: 2

Section: 7.3

18) A newly isolated natural product was found to have the molecular formula  $C_{15}H_{28}O_2$ . By hydrogenating a sample of the compound, it was determined to possess one p bond. How many rings are present in the compound?

1. A) 0
2. B) 1
3. C) 2
4. D) 3
5. E) 4

Answer: B

Diff: 2

Section: 7.3

19) The prostaglandin precursor arachidonic acid has the molecular formula  $C_{20}H_{32}O_2$ . Given that arachidonic acid is an acyclic carboxylic acid that contains no carbon-carbon triple bonds, how many carbon-carbon double bonds are present?

1. A) 2
2. B) 3
3. C) 4
4. D) 5



5. E) 6

Answer: C

Diff: 2

Section: 7.3

20) The steroid testosterone has the molecular formula  $C_{19}H_{28}O_2$ . Given that there are two P -bond in a molecule of testosterone, how many rings are present in each molecule?

1. A) 2
2. B) 3
3. C) 4
4. D) 5
5. E) 6

Answer: C

Diff: 2

Section: 7.3

21) How many elements of unsaturation are implied by the molecular formula  $C_5H_5NO_2$ ?

1. A) 0
2. B) 1
3. C) 2
4. D) 3
5. E) 4

Answer: E

Diff: 3

Section: 7.3

22) How many elements of unsaturation are implied by the molecular formula  $C_8H_{11}N$ ?

1. A) 0
2. B) 1
3. C) 2
4. D) 3
5. E) 4

Answer: E

Diff: 3

Section: 7.3

23) A chemist has isolated a new natural product and determined its molecular formula to be  $C_{24}H_{40}O_4$ . In hydrogenation experiments the chemist found that each mole of the natural product reacted with two moles of  $H_2$ . How many rings are present in the structure of the new natural product?

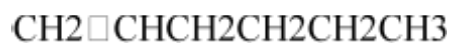
1. A) 2
2. B) 3
3. C) 4
4. D) 5
5. E) 6

Answer: B

Diff: 3

Section: 7.3

24) Provide the proper IUPAC name for the alkene shown below.



Answer: hex-1-ene

Diff: 1

Section: 7.4

25) Provide the proper IUPAC name for the alkene shown below.

Answer: cyclopentene

Diff: 1

Section: 7.4

26) Draw an acceptable structure for 4-ethylhept-1-ene.

Answer:

Diff: 1

Section: 7.4

27) Provide an acceptable name for  $(\text{CH}_3)_2\text{CHCH}=\text{C}(\text{CH}_3)\text{CH}_2\text{CH}_3$ .

Answer: 2,4-dimethyl-3-hexene or 2,4-dimethylhex-3-ene

Diff: 2

Section: 7.4

28) Provide an acceptable name for  $(\text{CH}_3\text{CH}_2)_2\text{CHCH}_2\text{CH}=\text{CH}_2$ .

Answer: 4-ethyl-1-hexene or 4-ethylhex-1-ene

Diff: 2

Section: 7.4

29) Which of the following alkenes can show geometric isomerism: 2,3-dichloro-2-pentene, 4-chloro-3-ethyl-3-hexene, 3-chloro-2-methyl-2-butene, and 3-chloro-2-methyl-1-butene?

Answer: 2,3-dichloro-2-pentene

Diff: 2

Section: 7.4

30) Name the compound shown below.

Answer: 2-propyl-1,3-cyclopentadiene or 2-propylcyclopenta-1,3-diene Diff:

2

Section: 7.4

31) Provide the proper IUPAC name for the alkene shown below.

Answer: 6-bromo-1-methylcyclohexene

Diff: 2

Section: 7.4

32) Provide the proper IUPAC name for the alkene shown below.

Answer: (R)-3-ethyl-3-methylcyclohexene

Diff: 2

Section: 7.4

33) Draw an acceptable structure for 4-phenylbut-1-ene.

Answer:

Diff: 2

Section: 7.4

34) Draw an acceptable structure for 1,2-dimethylcyclohexene.

Answer:

Diff: 2

Section: 7.4

35) Draw and name all alkenes which have the molecular formula C<sub>4</sub>H<sub>8</sub>.

Answer:

Diff: 2

Section: 7.4

36) Identify the correct name for the following structure.

1. A) 3-methoxy-5-methylcyclohepta-1,5-diene
2. B) 6-methoxy-1-methylcyclohepta-1,4-diene
3. C) 7-methoxy-5-methylcyclohepta-1,4-diene
4. D) 4-methoxy-2-methylcyclohepta-1,5-diene

Answer: B

Diff: 2

Section: 7.4

37) Name the alkene shown. Be sure to include the appropriate *E* or *Z* label necessary.

Answer: 2,5-dichloropent-1-ene

Diff: 2

Section: 7.4

38) Provide a correct IUPAC name for the structure below.

Answer: 5-bromo-2-methyl-1,3-cyclopentadiene

Diff: 3

Section: 7.4

39) Draw and name the six alkenes which have the molecular formula C<sub>5</sub>H<sub>10</sub>.

Answer:

Diff: 3

Section: 7.4

40) For which of the following alkenes will cis- and trans- isomers not exist?

1. A) a) only
2. B) b) only
3. C) both a) and c)
4. D) d) only
5. E) both c) and d)

Answer: A

Diff: 1

Section: 7.5

41) Provide the proper IUPAC name for the alkene shown below.

Answer: (*E*)-3,5-dimethylhex-2-ene

Diff: 1

Section: 7.5

42) Which of the following best describes the geometry about the carbon-carbon double bond in the alkene below?

1. A) *E*
2. B) *Z*
3. C) neither *E* nor *Z*

Answer: C

Diff: 2

Section: 7.5

43) Which of the following best describes the geometry about the carbon-carbon double bond in the alkene below?

1. A) *E*
2. B) *Z*
3. C) neither *E* nor *Z*

Answer: B

Diff: 2

Section: 7.5

44) Which of the following best describes the geometry about the carbon-carbon double bond in the alkene below?

1. A) *E*
2. B) *Z*
3. C) neither *E* nor *Z*

Answer: A



Diff: 2

Section: 7.5

45) Which of the following best describes the geometry about the carbon-carbon double bond in the alkene below?

1. A) *E*
2. B) *Z*
3. C) neither *E* nor *Z*

Answer: A

Diff: 2

Section: 7.5

46) Which of the following best describes the geometry about the carbon-carbon double bond in the alkene below?

1. A) *E*
2. B) *Z*
3. C) neither *E* nor *Z*

Answer: C

Diff: 2

Section: 7.5

47) Provide a structure for (*Z*)-4-bromo-3-heptene.

Answer:

Diff: 2

Section: 7.5

48) Provide the structure of (Z)-1-chloro-1-fluoro-1-butene.

Answer:

Diff: 2

Section: 7.5

49) Provide the proper IUPAC name for the alkene shown below.

Answer: (E)-3,4-dimethylhept-3-ene

Diff: 2

Section: 7.5

50) Provide the proper IUPAC name for the alkene shown below.

Answer: (Z)-5-chloropent-2-ene

Diff: 2

Section: 7.5

51) Provide the proper IUPAC name for the alkene shown below.

Answer: (*E*)-2-ethylhexa-1,4-diene

Diff: 2

Section: 7.5

52) Translate the following condensed structure to a line-angle structure.

(*E*) CH<sub>3</sub>CBrCH(CH<sub>2</sub>)<sub>2</sub>C(O)CH(CH<sub>3</sub>)<sub>2</sub> Answer:

Diff: 2

Section: 7.5

53) Name the alkene shown. Be sure to include the appropriate *E* or *Z* label necessary.

Answer: (*E*)-1-bromo-4-chlorohept-3-ene

Diff: 2

Section: 7.5

54) Draw an acceptable structure for (*Z*)-2-chloro-4-ethylhex-2-ene.

Answer:

Diff: 3

Section: 7.5

55) Provide the structure of the monomer from which PVC or poly(vinyl chloride) is made.

Answer:  $\text{H}_2\text{C}=\text{CHCl}$

Diff: 1

Section: 7.6

56) Draw the structure of polyethylene.

Answer:  $-\text{[CH}_2\text{CH}_2\text{]}_n-$

Diff: 2

Section: 7.6

57) Draw the structure of poly(tetrafluoroethylene) or Teflon.

Answer:  $-\text{[CF}_2\text{CF}_2\text{]}_n-$

Diff: 2

Section: 7.6

58) The compound produced when 3-methylpent-2-ene undergoes hydrogenation in the presence of a platinum catalyst is\_\_\_\_\_.

Answer: 3-methylpentane

Diff: 1

Section: 7.7

59) Circle the alkene below which has the smallest heat of hydrogenation.

Answer:

Diff: 2

Section: 7.7

60) Which has the smaller heat of hydrogenation, (E)-2-pentene or (Z)-2-pentene? What is the structural origin of this difference?

Answer: (E)-2-pentene has the smaller heat of hydrogenation. There is less steric strain between the alkyl substituents in the (E)-isomer than in the (Z)-isomer. Diff:

2

Section: 7.7

61) Using Zaitsev's rule, choose the most stable alkene among the following.

1. A) 1-methylcyclohexene
2. B) 3-methylcyclohexene
3. C) 4-methylcyclohexene
4. D) They are all of equal stability according to Zaitsev's rule.

Answer: A

Diff: 2

Section: 7.7

62) Using Zaitsev's rule, choose the most stable alkene among the following.

1. A) hex-1-ene

2. B) (*E*)-hex-2-ene
3. C) (*Z*)-hex-2-ene
4. D) They are all of equal stability according to Zaitsev's rule.

Answer: B

Diff: 2

Section: 7.7

63) Using Zaitsev's rule, choose the most stable alkene among the following.

1. A) 1,2-dimethylcyclohexene
2. B) 1,6-dimethylcyclohexene
3. C) *cis*-3,4-dimethylcyclohexene
4. D) They are all of equal stability according to Zaitsev's rule.

Answer: A

Diff: 2

Section: 7.7

64) Consider the constitutional isomers 2-methylbut-1-ene, 2-methylbut-2-ene, and

3-methylbut-1-ene. When each of these alkenes is subjected to catalytic hydrogenation (H<sub>2</sub>, Pt), a single product results. Which of the following best describes the structural relationship among these *products*?

1. A) The products are *cis-trans* isomers.
2. B) The products are identical.
3. C) The products are constitutional isomers.
4. D) The products are enantiomers.
5. E) The products are diastereomers.

Answer: B

Diff: 2

Section: 7.7

65) Which of the following alkenes has the largest molar heat of hydrogenation (ie, releases the most heat upon hydrogenation)?

1. A) 2,3-dimethyl-2-butene
2. B) 2-methyl-2-butene
3. C) trans-2-butene
4. D) cis-2-butene
5. E) 1-hexene

Answer: E

Diff: 2

Section: 7.7

66) Which of the following alkenes has the smallest molar heat of hydrogenation (ie, releases the least heat upon hydrogenation)?

1. A) 2,3-dimethyl-2-butene
2. B) 2-methyl-2-butene
3. C) trans-2-butene
4. D) cis-2-butene
5. E) 1-hexene

Answer: A

Diff: 2

Section: 7.7

67) The trans isomers of cycloalkenes with rings containing fewer than \_\_\_\_\_ atoms are unstable at room temperature.

Answer: 8

Diff: 2

Section: 7.7

68) Circle the most stable alkene in the set of isomers below.

Answer:

Diff: 2

Section: 7.7

69) Draw the alkene of formula C<sub>5</sub>H<sub>10</sub> which evolves the most heat per mole upon hydrogenation.

Answer: CH<sub>2</sub>=CHCH<sub>2</sub>CH<sub>2</sub>CH<sub>3</sub>

Diff: 2

Section: 7.7

70) Does the alkene shown below violate Bredt's rule?

Answer: No

Diff: 2



Section: 7.7

71) Does the alkene shown below violate Bredt's rule?

Answer: No

Diff: 2

Section: 7.7

72) Does the alkene shown below violate Bredt's rule?

Answer: Yes

Diff: 2

Section: 7.7

73) Does the alkene shown below violate Bredt's rule?

Answer: No

Diff: 2

Section: 7.7

74) Which sequence ranks the following compounds in order of increasing heat of hydrogenation,  $\Delta H_{\text{hyd}}$ ?

1 *cis*-2-butene

2 1-butene

3 cyclohexene

1. A) 3<1<2
2. B) 3<2<1
3. C) 2<1<3
4. D) 1<3<2

Answer: A

Diff: 2

Section: 7.7

75) Circle the alkene isomer that has the largest heat of hydrogenation.

Answer:

Diff: 2

Section: 7.7

76) Circle the most stable alkene in the set of isomers below.

Answer:

Diff: 2

Section: 7.7

77) Draw all likely alkene products in the following reaction and circle the product you expect to predominate.

Answer: No alkene product likely.

Diff: 2

Section: 7.7

78) There are three isomeric methylbutene structures. Draw each of them and then circle the isomer with the highest heat of hydrogenation.

Answer:

Diff: 3

Section: 7.7

79) Which of the following cycloalkenes would be expected to be stable?

1. A) 1 & 2
2. B) 2 & 3
3. C) 2
4. D) 1 & 3
5. E) None are stable.

Answer: D

Diff: 3

Section: 7.7

80) Compare the relative heats of hydrogenation of cyclobutene and cyclopentene and explain the difference in magnitude.

Answer: Cyclobutene's heat of hydrogenation is larger in magnitude than cyclopentene's by about 4 kcal/mol. This is due to additional ring strain introduced into the smaller ring by sp<sup>2</sup> centers.

Diff: 3

Section: 7.7

81) Which of the following compounds is an E isomer?

1. A)

1. B)

1. C)

1. D)

Answer: B

Diff: 3

Section: 7.7

82) Alkenes\_\_\_\_\_.

1. A) are relatively polar compounds
2. B) have lower boiling points than alcohols of similar molecular weight
3. C) are reasonably soluble in water
4. D) both A and B
5. E) none of the above

Answer: B

Diff: 2

Section: 7.8

83) Which has the higher boiling point, *cis*- or *trans*-hex-3-ene? Briefly explain your choice.

Answer: *Cis*-Hex-3-ene has the higher boiling point since it has a net molecular dipole moment while the *trans*-isomer does not. The presence of a permanent molecular dipole allows for stronger intermolecular attractions.

Diff: 2

Section: 7.8

84) Which of the alkyl chlorides listed below undergoes dehydrohalogenation in the presence of a strong base to give pent-2-ene as the only alkene product?

1. A) 1-chloropentane
2. B) 2-chloropentane
3. C) 3-chloropentane

4. D) 1-chloro-2-methylbutane
5. E) 1-chloro-3-methylbutane

Answer: C

Diff: 1

Section: 7.9

85) Dehydrohalogenation of 2-bromobutane in the presence of a strong base proceeds via which of the following mechanistic pathways?

1. A) SN1
2. B) SN2
3. C) E1
4. D) E2
5. E) none of the above

Answer: D

Diff: 1

Section: 7.9

86) Dehydrohalogenation of an alkyl halide by treating it with a strong base to yield an alkene product typically occurs by what reaction mechanism?

1. A) SN1
2. B) SN2
3. C) E1
4. D) E2
5. E) free radical

Answer: D

Diff: 1

Section: 7.9

87) What kind of reactive intermediate is present in the mechanism of the following reaction?

1. A) alkyne
2. B) allylic anion
3. C) allylic cation
4. D) allylic radical
5. E) benzylic cation

Answer: D

Diff: 2

Section: 7.9

88) Which of the following alkenes is the major product when 2-bromo-2methylpentane is treated with sodium ethoxide in ethanol?

1. A) 2-methylpent-1-ene
2. B) 2-methylpent-2-ene
3. C) (*E*)-4-methylpent-2-ene
4. D) (*Z*)-4-methylpent-2-ene
5. E) 4-methylpent-1-ene

Answer: B

Diff: 2

Section: 7.9

89) Which of the following alkenes is the major product when 2-bromo-2-methylpentane is treated with potassium *tert*-butoxide in *tert*-butanol?

1. A) 2-methylpent-1-ene
2. B) 2-methylpent-2-ene
3. C) (*E*)-4-methylpent-2-ene
4. D) (*Z*)-4-methylpent-2-ene
5. E) 4-methylpent-1-ene

Answer: A

Diff: 2

Section: 7.9

90) Which of the following statements applies to the E2 mechanism?

1. A) It occurs with inversion of stereochemistry.
2. B) It occurs with racemization of stereochemistry.
3. C) It proceeds through the more stable carbocation intermediate.
4. D) The C-H and C-X bonds that break must be anti.
5. E) Use of a bulky base gives the more highly substituted alkene product.

Answer: D

Diff: 2

Section: 7.9

91) Provide the structure of the major organic product of the reaction below.

Answer:

Diff: 2



Section: 7.9

92) Provide the structure of the major organic product of the reaction below.

Answer:

Diff: 2

Section: 7.9

93) Provide the structure of the major organic product of the reaction below.

Answer:

Diff: 2

Section: 7.9

94) Provide the structure of the major organic product of the reaction below.

Answer:

Diff: 2

Section: 7.9

95) Provide the structure of the major organic product of the reaction below.

Answer:

Diff: 2

Section: 7.9

96) Provide the structure of the major organic product of the reaction below.

Answer:

Diff: 2

Section: 7.9

97) Provide the major organic product in the reaction shown below.

Answer:

Diff: 2

Section: 7.9

98) Provide the major organic product in the reaction shown below.

Answer:

Diff: 2

Section: 7.9

99) Provide the major organic product in the reaction shown below.

Answer:

Diff: 2

Section: 7.9

100) Describe the major products of the following reaction and predict which of the products would predominate. Explain and defend your answer.

Answer: Possible products:

The Hofmann product would most likely predominate due to the coplanar cis configuration of the Br and H across the bridge. The E2 mechanism favors anti alignment of the H with the halogen leaving group. There are two possible antialigned H atoms that would lead to the Hofmann product.

Diff: 2

Section: 7.9

101) Draw all likely alkene products in the following reaction and circle the product you expect to predominate.

Answer:

Diff: 2

Section: 7.9

102) Draw all likely alkene products in the following reaction and circle the product you expect to predominate.

Answer:

Diff: 2

Section: 7.9

103) Draw all likely alkene products in the following reaction and circle the product you expect to predominate.

Answer:

Diff: 2

Section: 7.9

104) Draw all likely alkene products in the following reaction and circle the product you expect to predominate.

Answer:

Diff: 2

Section: 7.9

105) Draw the alkene product which results when 1-bromopentane is heated in acetone containing NaOH. Give a detailed, step-by-step mechanism for the production of this compound.

Answer:

Diff: 2

Section: 7.9

106) Which base, ammonia ( $\text{NH}_3$ ) or triethylamine  $[(\text{CH}_3\text{CH}_2)_3\text{N}]$ , would be a better choice for use in converting 1-chlorohexane to hex-1-ene? Explain briefly.

Answer: Triethylamine. Amines can serve as both nucleophiles and as bases in reactions with alkyl halides. Increasing the steric bulk about the nitrogen diminishes the nucleophilicity while allowing the amine to continue to function effectively as a base.

Diff: 2

Section: 7.9

107) Provide the reagents necessary for carrying out the transformation of cyclopentane to cyclopentene.

Answer:

1.  $\text{Br}_2, h\nu$
2.  $\text{NaOH}, \text{acetone}$

Diff: 2

Section: 7.9

108) Provide the reagents necessary for carrying out the transformation of 2-methylheptane to 2-methylhept-1-ene Answer:

1.  $\text{Br}_2, h\nu$
2.  $(\text{CH}_3)_3\text{CO-K}^+, (\text{CH}_3)_3\text{COH}$

Diff: 2

Section: 7.9

109) What reagent could be used to prepare cyclopentene from *trans*-1,2-dibromocyclopentane?

Answer: Zn/CH<sub>3</sub>CO<sub>2</sub>H

Diff: 2

Section: 7.9

110) Provide a series of steps through which 2-methylbutane is converted into 2-methylbut-1-ene?

Answer:

1. Br<sub>2</sub>, hn
2. (CH<sub>3</sub>)<sub>3</sub>CO-

Diff: 2

Section: 7.9

111) Identify the major product of the reaction below.

1. A)

1. B)

1. C)

1. D)

Answer: D

Diff: 3

Section: 7.9

112) Provide the name of the major alkene product that results when (2S,3S)-2-bromo-3-methylpentane is treated with sodium methoxide in methanol.

Answer: (E)-3-methyl-2-pentene

Diff: 3

Section: 7.9

113) Provide the name of the major alkene product that results when (2S,3R)-2-bromo-3-methylpentane is treated with sodium methoxide in methanol.

Answer: (Z)-3-methyl-2-pentene

Diff: 3

Section: 7.9

114) Provide the name of the major alkene product that results when (2R,3R)-2,3dibromopentane is treated with zinc in acetic acid.

Answer: (Z)-2-pentene

Diff: 3

Section: 7.9

115) Provide the name of the major alkene product that results when (2S,3R)-2,3dibromopentane is treated with zinc in acetic acid.

Answer: (E)-2-pentene

Diff: 3

Section: 7.9

116) Describe the major elimination products of the following reaction, including any stereochemistry, and indicate which structure will predominate. Explain and defend your answer.

Answer: Possible products:

This reaction would be predicted to follow an E2 anti-elimination in the formation of 2 – Zaitzev products (E and Z) and the 1 Hofmann product. The predicted predominating species would be the Zaitzev (E) structure because E2 favors anti alignment of the beta-H and the halogen. When considering 2 -beta H atoms in an E2 elimination, the best alignment would be achieved when the starting material



assumes a conformation where the methyl and phenyl groups are aligned anti with respect to each other in a Newman projection.

Diff: 3

Section: 7.9

117) Provide the reagents necessary for carrying out the transformation of 2-methylheptane to 2-methylhept-2-ene.

Answer:

1. Br<sub>2</sub>, hν
2. NaOH, acetone

Diff: 3

Section: 7.9

118) By what mechanism does cyclohexanol react when treated in sulfuric acid and what compound results?

1. A) E1; methoxycyclohexane
2. B) E2; methoxycyclohexane
3. C) SN1; methoxycyclohexane
4. D) E2; cyclohexene
5. E) E1; cyclohexene

Answer: E

Diff: 2

Section: 7.10

119) In the group shown below, which of the following alcohols is (are) likely to yield a product where skeletal rearrangement has occurred when treated with sulfuric acid?

3-methyl-3-pentanol, 3,3-dimethyl-2-butanol, 2,2-dimethylcyclohexanol

1. A) 3-methyl-3-pentanol only
2. B) 3,3-dimethyl-2-butanol only
3. C) 2,2-dimethylcyclohexanol only
4. D) both 3,3-dimethyl-2-butanol and 2,2-dimethylcyclohexanol
5. E) None of these three alcohols is prone to rearrangement.

Answer: D

Diff: 2

Section: 7.10