

## QOI 0809 -O-

Name \_\_\_\_\_

**MULTIPLE CHOICE.** Choose the one alternative that best completes the statement or answers the question.

- 1) What is the hybridization of the oxygen atom in dialkyl ethers? 1) \_\_\_\_\_  
A)  $sp^2$                       B) s                      C) p                      D)  $sp^3$                       E) sp

**SHORT ANSWER.** Write the word or phrase that best completes each statement or answers the question.

- 2) Draw structures which show the hydrogen bonding interaction that exists between water and dimethyl ether. 2) \_\_\_\_\_

**ESSAY.** Write your answer in the space provided or on a separate sheet of paper.

- 3) Which has the higher boiling point, diethyl ether or butan-1-ol? Briefly explain.
- 4) Give two properties of ethers which allow them to be commonly used as solvents in organic reactions.
- 5) What complex results when  $BF_3$  is dissolved in dimethyl ether?
- 6) Provide a structural representation of 2-ethoxypentane.
- 7) Provide a structural representation of isopropyl *tert*-butyl ether.
- 8) Provide a structural representation of 1,2-epoxybutane (also called 2-ethyloxirane).
- 9) Provide a structural representation of oxetane.
- 10) Provide a structural representation of 3-ethylfuran.
- 11) Provide a structural representation of *cis*-3-ethyl-1,2-epoxycyclopentane.
- 12) In mass spectrometry, what is the most common fragmentation of ethers?
- 13) Propose a structure for the ether of formula  $C_4H_{10}O$  with the following  $^1H$  NMR signals:  $\delta$  1.20 (triplet, 6H),  $\delta$  3.45 (quartet, 4H) (ppm).
- 14) Propose a structure for the ether of formula  $C_4H_{10}O$  with the following  $^1H$  NMR signals:  $\delta$  0.95 (triplet, 3H), 1.52 (multiplet, 2H), 3.30 (singlet, 3H), 3.40 (triplet, 2H) (ppm).
- 15) Propose a structure for the ether of formula  $C_4H_{10}O$  with the following  $^1H$  NMR signals:  $\delta$  1.13 (doublet, 6H), 3.30 (singlet, 3H), 3.65 (septet, 1H) (ppm).
- 16) What is the chemical shift of the carbon bound to oxygen in ethers in  $^{13}C$  NMR?

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

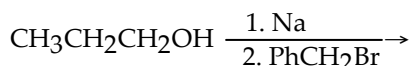
- 17) The Williamson ether synthesis occurs by the \_\_\_\_\_ mechanistic pathway. 17) \_\_\_\_\_
- 18) Show the best method for preparing methoxycyclopentane via the Williamson ether synthesis. 18) \_\_\_\_\_
- 19) Show the best method for preparing 4-propoxytoluene via the Williamson ether synthesis. 19) \_\_\_\_\_

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

- 20) Which pair of reagents would produce the highest yield of (*R*)-2-ethoxybutane? 20) \_\_\_\_\_
- A) sodium ethoxide + (*S*)-2-iodobutane  
B) sodium (*S*)-2-butoxide + iodoethane  
C) sodium ethoxide + (*R*)-2-iodobutane  
D) sodium (*R*)-2-butoxide + iodoethane  
E) Both B and C would work equally well.

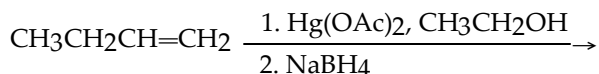
**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

- 21) Provide the major organic product in the reaction below. 21) \_\_\_\_\_



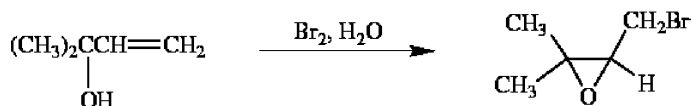
**ESSAY. Write your answer in the space provided or on a separate sheet of paper.**

- 22) Provide the major organic product in the reaction below.

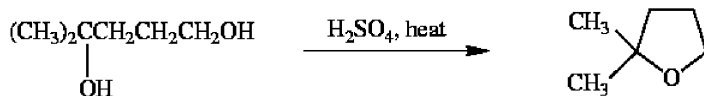


- 23) Show the reagents necessary for the conversion of 1-bromo-1-methylcyclopentane to 1-ethoxy-1-methylcyclopentane.

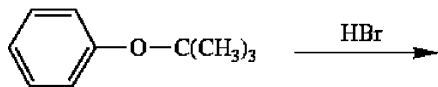
- 24) Suggest a reasonable mechanism for the reaction shown below.



- 25) Suggest a reasonable mechanism for the reaction shown below.



26) Predict the products of the following reaction and give a reasonable mechanism for their formation.



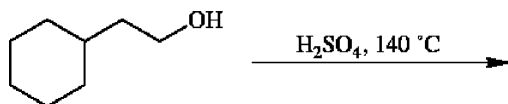
27) Provide two reasons why it would be difficult to prepare ethoxycyclopentane via an intermolecular dehydration route from ethanol and cyclopentanol.

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

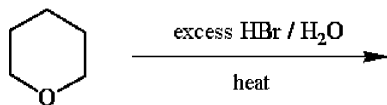
- 28) When hexan-1-ol is treated with conc. H<sub>2</sub>SO<sub>4</sub> at moderate temperatures, \_\_\_\_\_ is formed via 28) \_\_\_\_\_ a(n) \_\_\_\_\_ mechanism.
- A) di-*n*-hexyl ether, S<sub>N</sub>2
  - B) di-*n*-hexyl ether, E2
  - C) di-*n*-propyl ether, E1
  - D) di-*n*-hexyl ether, S<sub>N</sub>1
  - E) hex-1-ene, S<sub>N</sub>1

**ESSAY. Write your answer in the space provided or on a separate sheet of paper.**

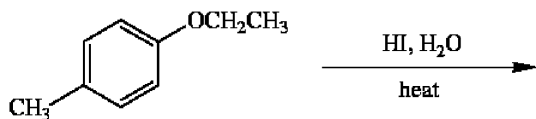
29) Provide the major organic product in the reaction below.



30) Provide the major organic product in the reaction below.



31) Provide the major organic product(s) in the reaction below.



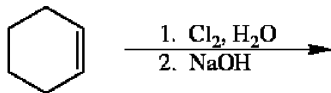
**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

- 32) Di-*n*-pentyl ether can be converted to 1-bromopentane by treatment with HBr through essentially 32) \_\_\_\_\_ a(n) \_\_\_\_\_ mechanism.
- A) S<sub>N</sub>1
  - B) E2
  - C) E1
  - D) S<sub>N</sub>2
  - E) ring opening

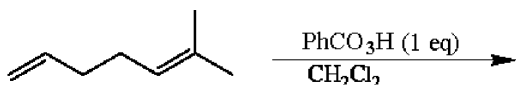
**ESSAY. Write your answer in the space provided or on a separate sheet of paper.**

33) When ethers are stored in the presence of oxygen, what explosive materials can result from autoxidation of the ether?

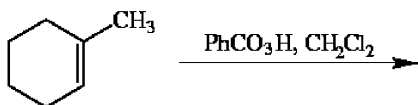
34) Provide the major organic product in the reaction below.



35) Provide the major organic product in the reaction below.



36) Provide the major organic product in the reaction below.



37) Provide the major organic product in the reaction below.



**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

38) When trans-hex-3-ene is treated with  $\text{PhCO}_3\text{H}$ , the major organic product is:

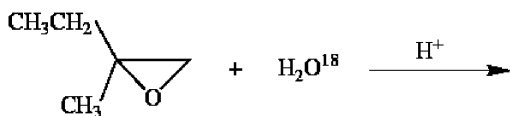
38) \_\_\_\_\_

- A) a meso epoxide
- B) hexan-3-ol
- C) a meso diol
- D) a 1:1 mixture of enantiomeric diols
- E) a 1:1 mixture of enantiomeric epoxides

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

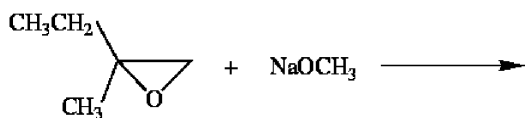
39) Provide the major organic product in the reaction below.

39) \_\_\_\_\_

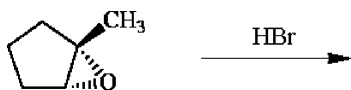


ESSAY. Write your answer in the space provided or on a separate sheet of paper.

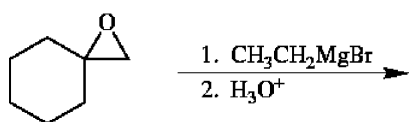
40) Provide the major organic product in the reaction below.



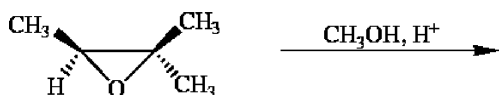
41) Provide the major organic product in the reaction below.



42) Provide the major organic product in the reaction below.



43) Provide the major organic product in the reaction below.



MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

44) What results when but-1-ene is subjected to the following reaction sequence:

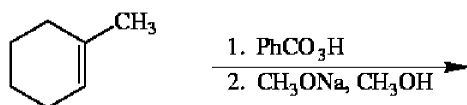
44) \_\_\_\_\_

(1)  $\text{Cl}_2, \text{H}_2\text{O}$ , (2)  $\text{NaOH}$ , (3)  $\text{H}_3\text{O}^+$ ?

- A) a 1:1 mixture of enantiomeric epoxides
- B) a meso epoxide
- C) butan-2-ol
- D) a meso diol
- E) a 1:1 mixture of enantiomeric diols

ESSAY. Write your answer in the space provided or on a separate sheet of paper.

45) Provide the major organic product in the reaction below.



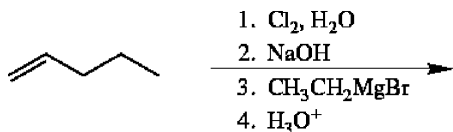
46) What is the stereochemistry of the product of the acid hydrolysis of *trans*-2,3-epoxybutane?

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

- 47) What are the expected products of the reaction of PhOCH<sub>3</sub> with concentrated HI? 47) \_\_\_\_\_
- A) iodobenzene and methanol  
B) iodobenzene and iodomethane  
C) phenol and iodomethane  
D) phenol and methanol

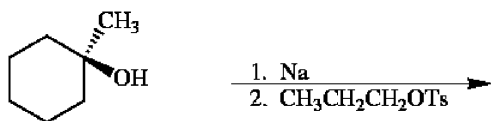
**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

- 48) Provide the major organic product in the reaction below. 48) \_\_\_\_\_



**ESSAY. Write your answer in the space provided or on a separate sheet of paper.**

- 49) Provide the major organic product in the reaction below.

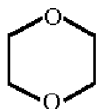


**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

- 50) When cyclohexene is subjected to mercuriation in methanol and the resulting mixture is reduced with sodium borohydride, the major organic product is: 50) \_\_\_\_\_
- A) a meso ether  
B) a 1:1 mixture of enantiomeric diols  
C) a meso diol  
D) methoxycyclohexane  
E) a 1:1 mixture of enantiomeric ethers

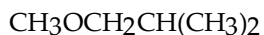
**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

- 51) Provide an acceptable name for the compound shown below. 51) \_\_\_\_\_

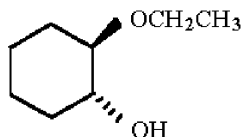


**ESSAY. Write your answer in the space provided or on a separate sheet of paper.**

- 52) Provide an acceptable name for the compound shown below.



53) Provide an acceptable name for the compound shown below.



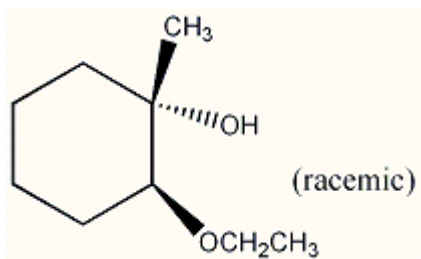
54) Provide an acceptable name for the compound shown below.



55) Show the reagents necessary to prepare *trans*-2-deuteriocyclohexan-1-ol from cyclohexene.

56) Show the reagents necessary to prepare 2-phenylethanol from bromobenzene.

57) Show the reagents necessary to prepare the compound below from cyclohexanone.



58) Show the reagents necessary to prepare 1-ethoxy-1-methylcyclopentane from 1-methylcyclopentene.

59) Show the reagents necessary to prepare 1,2-epoxy-1-methylcyclopentane from cyclopentanone.

60) Show the reagents necessary to prepare *trans*-1,2-cyclopentane-1,2-diol from cyclopentene.

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

61) Which of the following corresponds to the COC bond angle in dimethyl ether? 61) \_\_\_\_\_  
A) 110°      B) 180°      C) 122°      D) 60°      E) 94°

62) Which of the following is not a property of ethers which makes them good solvents in organic reactions? 62) \_\_\_\_\_  
A) They have relatively high boiling points for their molecular weights.  
B) They are nonhydroxylic.  
C) They dissolve a wide range of polar substances.  
D) They dissolve a wide range of nonpolar substances.  
E) They are normally unreactive toward strong bases.

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

63) Anisole is known by two other names. Give either of them. 63) \_\_\_\_\_

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

- 64) Which of the following is not a true statement? 64) \_\_\_\_\_  
A) Pyrans are six-membered-ring ethers.  
B) Oxetanes are five-membered ring ethers.  
C) Dioxanes are six-membered ring ethers.  
D) Oxiranes are three-membered ring ethers.  
E) Furans are five-membered ring ethers.
- 65) When pent-1-ene is treated with mercury(II) acetate in methanol and the resulting product is reacted with  $\text{NaBH}_4$ , what is the primary organic compound which results? 65) \_\_\_\_\_  
A) 1-ethoxypentane  
B) 2-methoxypentane  
C) 1-methoxypentane  
D) 2-ethoxypentane  
E) 3-ethoxypentane

**ESSAY. Write your answer in the space provided or on a separate sheet of paper.**

- 66) Can one prepare di-*sec*-butyl ether in good yield by heating butan-2-ol in the presence of sulfuric acid? Explain.

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

- 67) What is the major organic product which results when tetrahydrofuran is reacted with excess  $\text{HBr}$ ? 67) \_\_\_\_\_  
A) 4-bromobutan-1-ol  
B) 1,4-dibromobutane  
C) 1,2-dibromobutane  
D) 1,3-dibromobutane  
E) 3-bromobutan-1-ol

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

- 68) What term is given to the sulfur analogues of ethers? 68) \_\_\_\_\_

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

- 69) Which of the following is produced by the reaction of  $(\text{CH}_3\text{CH}_2)_2\text{S}$  with  $\text{CH}_3\text{CH}_2\text{I}$ ? 69) \_\_\_\_\_  
A)  $\text{CH}_3\text{SCH}_2\text{CH}_2\text{CH}_3$   
B)  $(\text{CH}_3\text{CH}_2)_3\text{S}^+ \text{I}^-$   
C)  $\text{CH}_3\text{CH}_2\text{SCH}_2\text{CH}_2\text{I}$   
D)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{I}$   
E)  $(\text{CH}_3\text{CH}_2)_3\text{S}$

**ESSAY. Write your answer in the space provided or on a separate sheet of paper.**

- 70) Why are sulfonium salts good alkylating agents?

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

- 71) Provide the structure of 3-methoxyfuran. 71) \_\_\_\_\_

72) Provide the structure of 4,4-dimethylpyran.

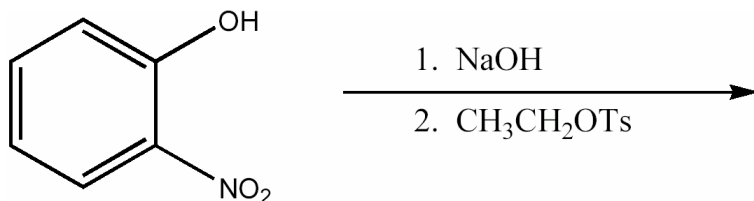
72) \_\_\_\_\_

73) Provide the sequence of reactions by which propoxycyclohexane can be prepared through a Williamson ether synthesis.

73) \_\_\_\_\_

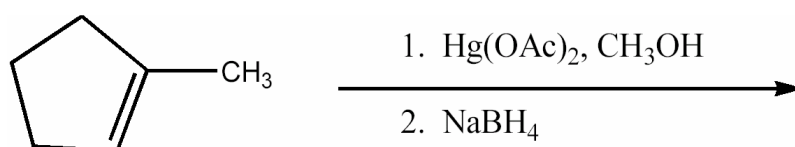
74) Provide the major organic product of the following reactions.

74) \_\_\_\_\_



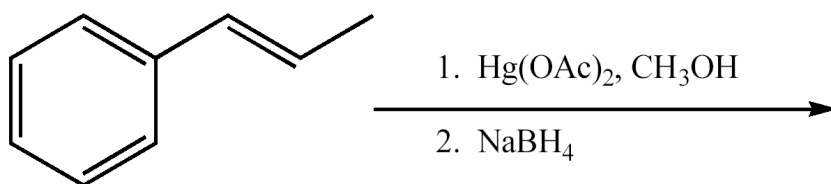
75) Provide the major organic product of the following reactions.

75) \_\_\_\_\_



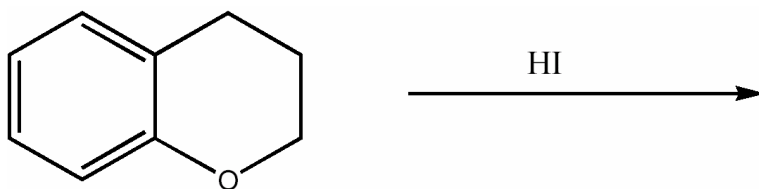
76) Provide the major organic product of the following reactions.

76) \_\_\_\_\_



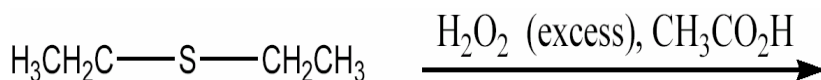
77) Provide the major organic product of the following reactions.

77) \_\_\_\_\_



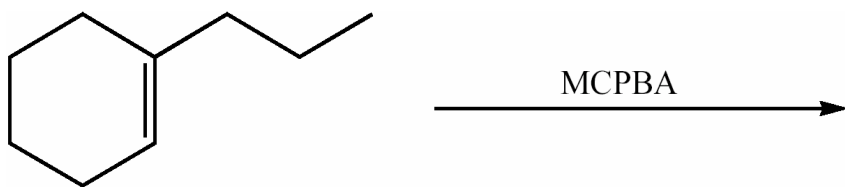
78) Provide the major organic product of the following reactions.

78) \_\_\_\_\_



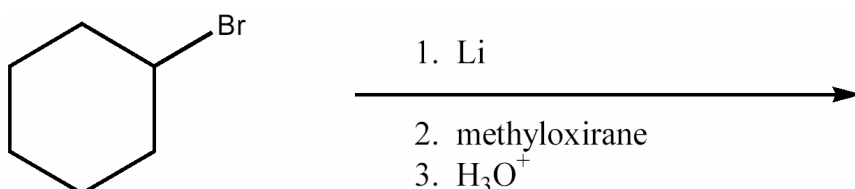
79) Provide the major organic product of the following reactions.

79) \_\_\_\_\_



80) Provide the major organic product of the following reactions.

80) \_\_\_\_\_



**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

81) What compound is formed when ethylene oxide is reacted with n-pentyllithium followed by treatment with aqueous acid? 81) \_\_\_\_\_

- A) 2-heptanone
- B) pentanal
- C) 2-heptanol
- D) heptanal
- E) 1-heptanol

82) What compound is formed when methyloxirane is reacted with ethylmagnesium bromide followed by treatment with aqueous acid? 82) \_\_\_\_\_

- A) 1-pentanol
- B) 2-pentanol
- C) 2-methyl-2-butanol
- D) 3-methyl-1-butanol
- E) 2-methyl-1-butanol

83) What compound is formed when 2,2-dimethyloxirane is treated with ethanol containing a trace of HCl? 83) \_\_\_\_\_

- A) 1-ethoxy-2-methyl-2-propanol
- B) 2-ethoxy-2-methyl-2-propanol
- C) 2-ethoxy-1-butanol
- D) 1-ethoxy-2-butanol
- E) 2-ethoxy-2-methyl-1-propanol

84) What results when cyclopentene oxide is treated with aqueous base? 84) \_\_\_\_\_

- A) a racemic mixture of cis-1,2-diols
- B) a racemic mixture of trans-1,2-diols
- C) a meso trans-1,2-diol
- D) a meso cis-1,2-diol
- E) cyclopentene

- 85) Through what mechanisms can a 1,2-halohydrin be converted into an epoxide? 85) \_\_\_\_\_  
A) polymerization  
B) S<sub>N</sub>1  
C) E2  
D) S<sub>N</sub>2  
E) electrophilic addition
- 86) Magnesium monoperoxyphthalate is often used as a reagent in what process? 86) \_\_\_\_\_  
A) epoxidation  
B) dehydration  
C) halohydrin formation  
D) reductive amination  
E) Williamson ether synthesis
- 87) In biological systems, sulfonium salts such as SAM serve what function? 87) \_\_\_\_\_  
A) esterifying agents  
B) nucleophilic agents  
C) alkylating agents  
D) crown ether agents  
E) epoxidizing agents

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

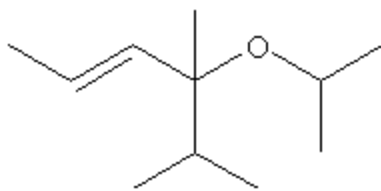
- 88) The presence of what product of the autooxidation of ethers makes the distillation of ethers dangerous? 88) \_\_\_\_\_

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

- 89) Treatment of tetrahydrofuran with excess HBr results in the formation of what major organic product? 89) \_\_\_\_\_  
A) 1,4-dibromobutane  
B) 1,5-dibromopentane  
C) 1-bromopentane  
D) 1,2-dibromobutane  
E) 1-bromobutane
- 90) Which of the following is the best way to synthesize t-butyl ethyl ether? 90) \_\_\_\_\_  
A) treating t-butyl bromide with Hg(OAc)<sub>2</sub>  
B) treating t-butanol with Hg(OAc)<sub>2</sub>  
C) treatment of ethyl bromide with sodium t-butoxide  
D) treatment of t-butyl bromide with sodium ethoxide  
E) heating a mixture of ethanol and t-butanol in sulfuric acid

91) What is the complete systematic IUPAC name for the following compound?

91) \_\_\_\_\_

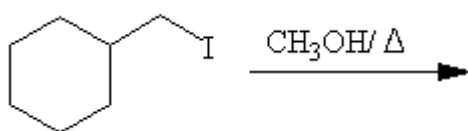


- A) 4-(1-methylethoxy)-4-isopropyl-4-methylpent-2-ene
- B) 4-isopropoxy-4,5-dimethylhex-2-ene
- C) 4-isopropyl-2,4-dimethylhept-5-en-3-ol
- D) isopropyl-(4-isopropyl-4-methylbut-2-enyl) ether
- E) 4-isopropyl-4-methylbut-2-en-isopropyl ether

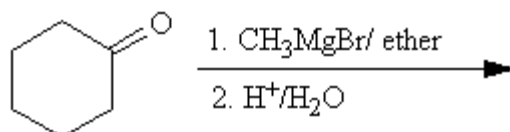
92) Which of the following reactions is classified as a Williamson ether synthesis?

92) \_\_\_\_\_

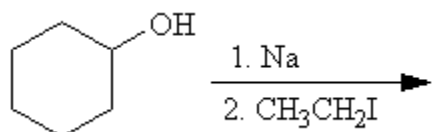
A)



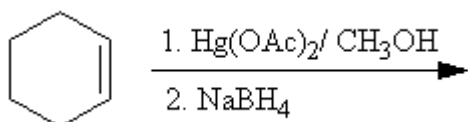
B)



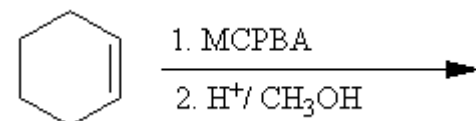
C)



D)



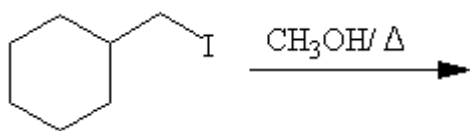
E)



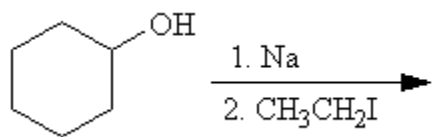
93) Which of the following reactions or series of reactions will lead to formation of trans-2-methoxycyclohexanol?

93) \_\_\_\_\_

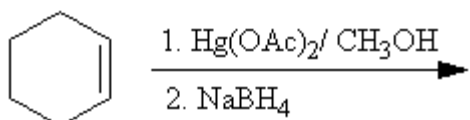
A)



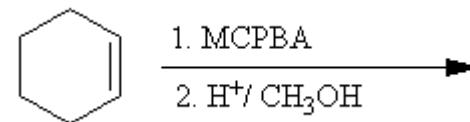
B)



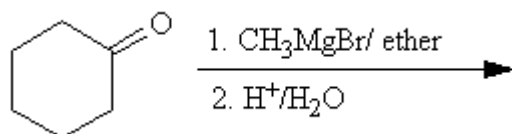
C)



D)



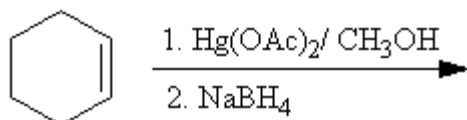
E)



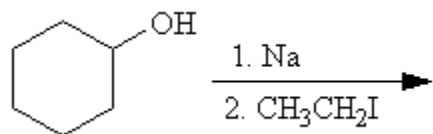
94) Which of the following reactions or series of reactions will lead to the formation of methoxycyclohexane?

94) \_\_\_\_\_

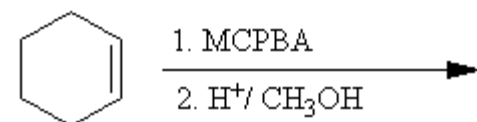
A)



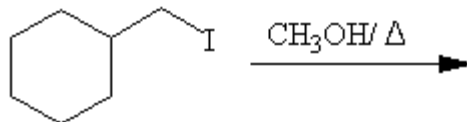
B)



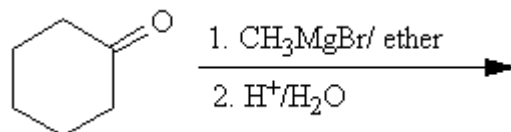
C)



D)



E)



95) What is the major difference in the structure of the product formed in a Grignard reaction when an alkyl magnesium halide (Grignard reagent) is reacted with an epoxide rather than an aldehyde or ketone followed by work-up with  $\text{H}_3\text{O}^+$ ?

95) \_\_\_\_\_

- A) The alkyl group from the Grignard reagent will be bonded to the  $\beta$ -carbon of the alcohol product.
- B) The alkyl group from the Grignard reagent will be bonded to the  $\alpha$ -carbon of the alcohol product.
- C) The epoxide will protonate the Grignard reagent resulting an alkane product.
- D) The alkyl group from the Grignard reagent will form an ether product rather than an alcohol product.
- E) Two equivalents of the Grignard will result in the bonding of two alkyl groups to the  $\alpha$ -carbon of the alcohol product.

# Answer Key

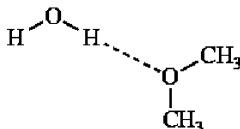
Testname: UNTITLED5

1) D

ID: oc6w 14-1

Diff: 1

2)



ID: oc6w 14-2

Diff: 2

3) Butan-1-ol has the higher boiling point since intermolecular hydrogen bonding can occur. Molecules of diethyl ether are incapable of hydrogen bonding with each other.

ID: oc6w 14-3

Diff: 1

4) 1. Dissolve a wide variety of both polar and nonpolar compounds.

2. Tend to be unreactive under a large number of reaction conditions.

3. Have low boiling points; easily removed from product mixture.

ID: oc6w 14-4

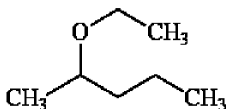
Diff: 2

5) (CH<sub>3</sub>)<sub>2</sub>O·BF<sub>3</sub>

ID: oc6w 14-5

Diff: 2

6)



ID: oc6w 14-6

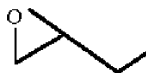
Diff: 1

7) (CH<sub>3</sub>)<sub>2</sub>CHOC(CH<sub>3</sub>)<sub>3</sub>

ID: oc6w 14-7

Diff: 1

8)



ID: oc6w 14-8

Diff: 1

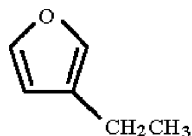
9)



ID: oc6w 14-9

Diff: 2

10)



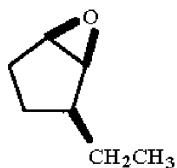
ID: oc6w 14-10

Diff: 2

# Answer Key

Testname: UNTITLED5

11)



ID: oc6w 14-11

Diff: 2

12) Cleavage next to one of the carbon atoms bonded to oxygen.

ID: oc6w 14-12

Diff: 2

13)  $\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3$

ID: oc6w 14-13

Diff: 2

14)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{OCH}_3$

ID: oc6w 14-14

Diff: 2

15)  $(\text{CH}_3)_2\text{CHOCH}_3$

ID: oc6w 14-15

Diff: 2

16)  $\delta$  65 to  $\delta$  90

ID: oc6w 14-16

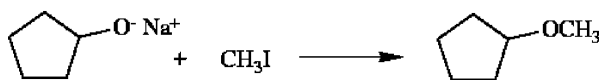
Diff: 3

17)  $\text{S}_{\text{N}}2$

ID: oc6w 14-17

Diff: 1

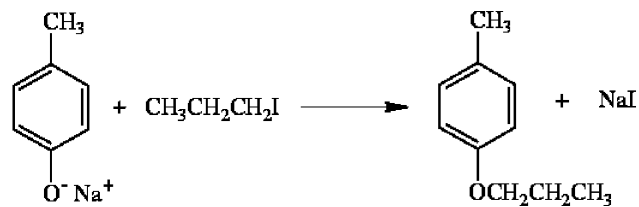
18)



ID: oc6w 14-18

Diff: 1

19)



ID: oc6w 14-19

Diff: 2

20) D

ID: oc6w 14-20

Diff: 2

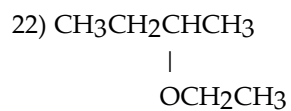
21)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{OCH}_2\text{Ph}$

ID: oc6w 14-21

Diff: 1

Answer Key

Testname: UNTITLED5



ID: oc6w 14-22

Diff: 2

- 23) 1.  $\text{NaOCH}_3$   
 2.  $\text{Hg}(\text{OAc})_2, \text{CH}_3\text{CH}_2\text{OH}$   
 3.  $\text{NaBH}_4$

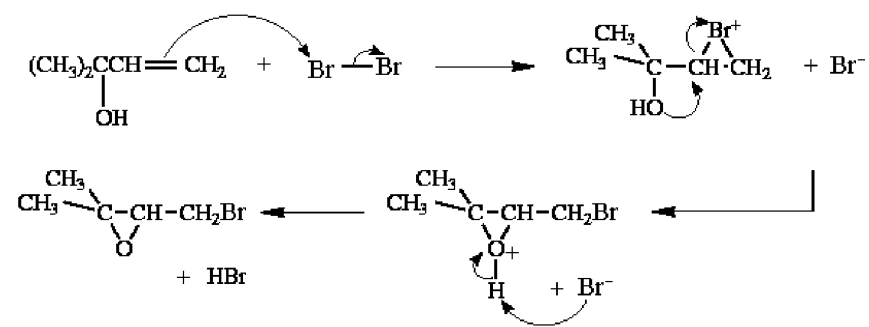
or

1.  $\text{H}_2\text{O}$ , heat  
 2.  $\text{Na}$   
 3.  $\text{CH}_3\text{CH}_2\text{I}$

ID: oc6w 14-23

Diff: 2

24)

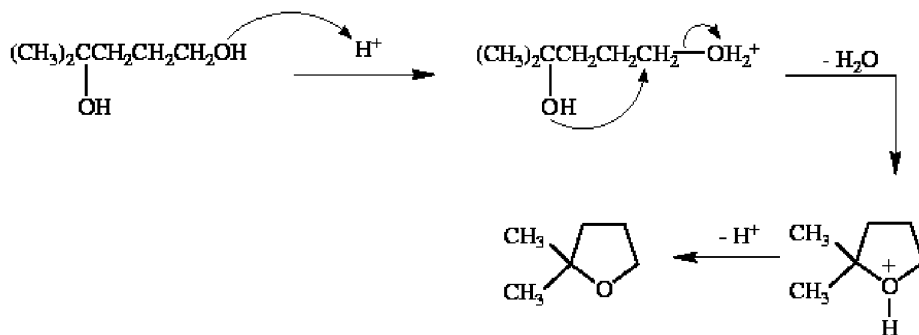


ID: oc6w 14-24

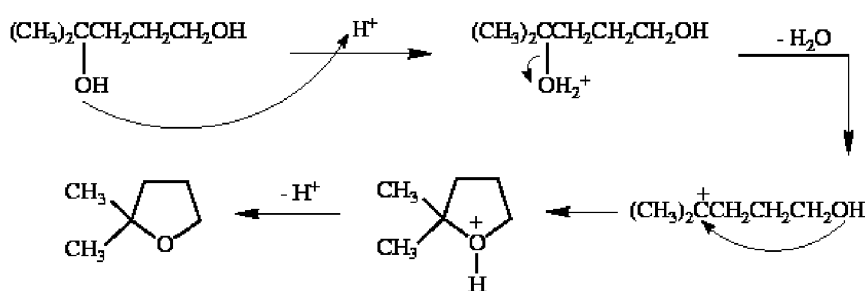
Diff: 2

Answer Key  
 Testname: UNTITLED5

25)



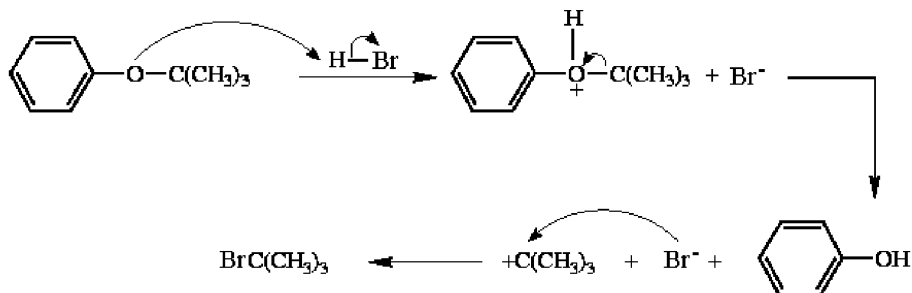
or



ID: oc6w 14-25

Diff: 2

26)



ID: oc6w 14-26

Diff: 2

27) 1. Secondary alcohols tend to yield alkenes under these conditions.

2. Symmetrical ethers would be produced as well.

ID: oc6w 14-27

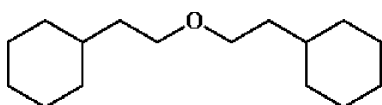
Diff: 2

28) A

ID: oc6w 14-28

Diff: 2

29)



ID: oc6w 14-29

Diff: 2

# Answer Key

Testname: UNTITLED5

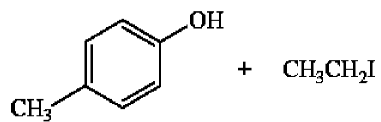
30)



ID: oc6w 14-30

Diff: 3

31)



ID: oc6w 14-31

Diff: 1

32) D

ID: oc6w 14-32

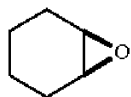
Diff: 1

33) hydroperoxides or dialkylperoxides

ID: oc6w 14-33

Diff: 2

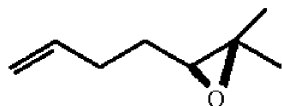
34)



ID: oc6w 14-34

Diff: 1

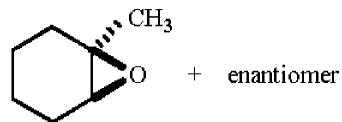
35)



ID: oc6w 14-35

Diff: 2

36)



ID: oc6w 14-36

Diff: 1

37)



ID: oc6w 14-37

Diff: 3

38) E

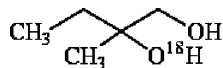
ID: oc6w 14-38

Diff: 2

Answer Key

Testname: UNTITLED5

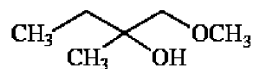
39)



ID: oc6w 14-39

Diff: 3

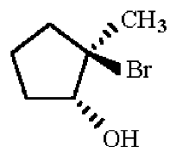
40)



ID: oc6w 14-40

Diff: 2

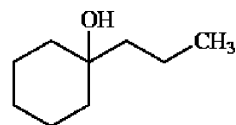
41)



ID: oc6w 14-41

Diff: 3

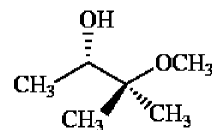
42)



ID: oc6w 14-42

Diff: 2

43)



ID: oc6w 14-43

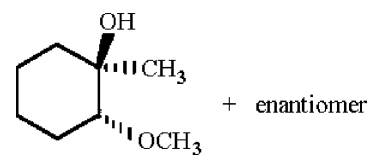
Diff: 2

44) E

ID: oc6w 14-44

Diff: 3

45)



ID: oc6w 14-45

Diff: 2

46) meso

ID: oc6w 14-46

Diff: 2

47) C

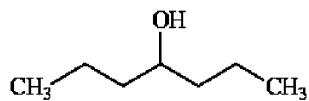
ID: oc6w 14-47

Diff: 1

# Answer Key

Testname: UNTITLED5

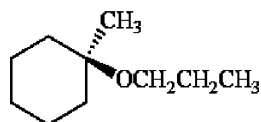
48)



ID: oc6w 14-48

Diff: 2

49)



ID: oc6w 14-49

Diff: 1

50) D

ID: oc6w 14-50

Diff: 2

51) 1,4-dioxane

ID: oc6w 14-51

Diff: 3

52) isobutyl methyl ether or 1-methoxy-2-methylpropane

ID: oc6w 14-52

Diff: 2

53) *trans*-2-ethoxycyclohexan-1-ol

ID: oc6w 14-53

Diff: 2

54) propylene oxide or methyloxirane

ID: oc6w 14-54

Diff: 2

55) 1. PhCO<sub>3</sub>H

2. LiAlD<sub>4</sub>

ID: oc6w 14-55

Diff: 3

56) 1. Mg, ether

2. oxirane

3. H<sub>3</sub>O<sup>+</sup>

ID: oc6w 14-56

Diff: 2

57) 1. CH<sub>3</sub>MgBr

2. conc. H<sub>2</sub>SO<sub>4</sub>

3. PhCO<sub>3</sub>H

4. H<sup>+</sup>, CH<sub>3</sub>CH<sub>2</sub>OH

ID: oc6w 14-57

Diff: 3

58) 1. Hg(OAc)<sub>2</sub>, CH<sub>3</sub>CH<sub>2</sub>OH

2. NaBH<sub>4</sub>

ID: oc6w 14-58

Diff: 1

## Answer Key

Testname: UNTITLED5

59) 1.  $\text{CH}_3\text{MgBr}$

2. conc.  $\text{H}_2\text{SO}_4$

3.  $\text{PhCO}_3\text{H}$

ID: oc6w 14-59

Diff: 2

60) 1.  $\text{PhCO}_3\text{H}$

2.  $\text{H}_3\text{O}^+$

ID: oc6w 14-60

Diff: 1

61) A

ID: oc6w 14-61

Diff: 1

62) A

ID: oc6w 14-62

Diff: 2

63) methoxybenzene or methyl phenyl ether

ID: oc6w 14-63

Diff: 1

64) B

ID: oc6w 14-64

Diff: 2

65) B

ID: oc6w 14-65

Diff: 2

66) This would not be an appropriate method of preparing di-*sec*-butyl ether in good yield. When butan-2-ol, a 2° alcohol, is heated in the presence of strong acid, the major product is 2-butene, the elimination product.

ID: oc6w 14-66

Diff: 2

67) B

ID: oc6w 14-67

Diff: 3

68) sulfides or thioethers

ID: oc6w 14-68

Diff: 1

69) B

ID: oc6w 14-69

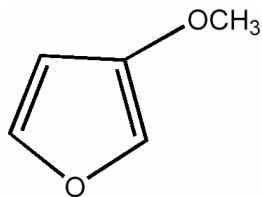
Diff: 2

70) Sulfonium salts are good alkylating agents because the leaving group is an uncharged sulfide.

ID: oc6w 14-70

Diff: 2

71)

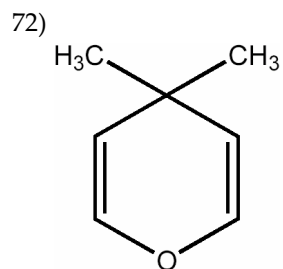


ID: oc6w 14-71

Diff: 1

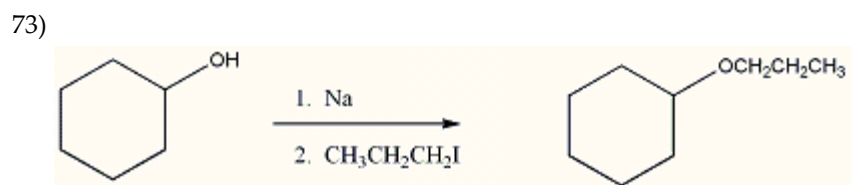
Answer Key

Testname: UNTITLED5



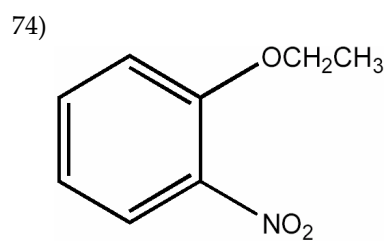
ID: oc6w 14-72

Diff: 2



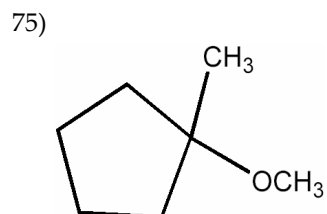
ID: oc6w 14-73

Diff: 2



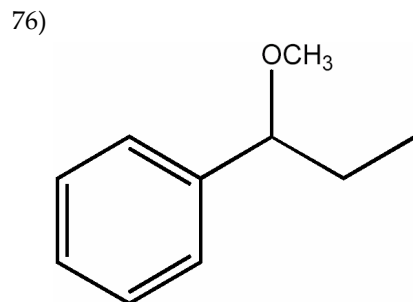
ID: oc6w 14-74

Diff: 2



ID: oc6w 14-75

Diff: 2



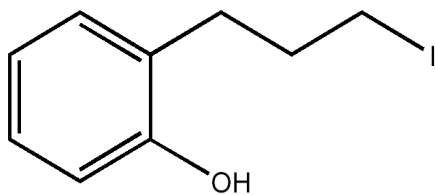
ID: oc6w 14-76

Diff: 2

Answer Key

Testname: UNTITLED5

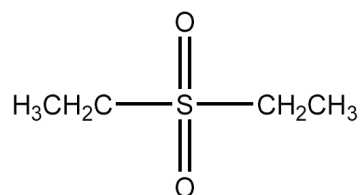
77)



ID: oc6w 14-77

Diff: 2

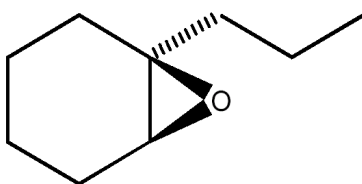
78)



ID: oc6w 14-78

Diff: 2

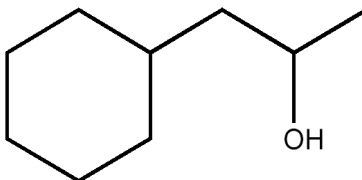
79)



ID: oc6w 14-79

Diff: 2

80)



ID: oc6w 14-80

Diff: 2

81) E

ID: oc6w 14-81

Diff: 2

82) B

ID: oc6w 14-82

Diff: 2

83) E

ID: oc6w 14-83

Diff: 2

84) B

ID: oc6w 14-84

Diff: 2

85) D

ID: oc6w 14-85

Diff: 2

## Answer Key

Testname: UNTITLED5

86) A

ID: oc6w 14-86

Diff: 2

87) C

ID: oc6w 14-87

Diff: 2

88) dialkyl peroxides

ID: oc6w 14-88

Diff: 2

89) A

ID: oc6w 14-89

Diff: 2

90) D

ID: oc6w 14-90

Diff: 2

91) B

ID: oc6w 14-91

Diff: 2

92) C

ID: oc6w 14-92

Diff: 2

93) D

ID: oc6w 14-93

Diff: 2

94) A

ID: oc6w 14-94

Diff: 2

95) A

ID: oc6w 14-95

Diff: 1