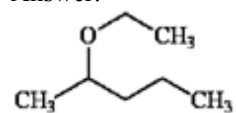


Organic Chemistry, 6e (Wade)
Chapter 14: Ethers, Epoxides, and Sulfides

6) Provide a structural representation of 2-ethoxypentane.

Answer:



Diff: 1

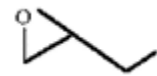
7) Provide a structural representation of isopropyl *tert*-butyl ether.

Answer: (CH₃)₂CHOC(CH₃)₃

Diff: 1

8) Provide a structural representation of 1,2-epoxybutane (also called 2-ethyloxirane).

Answer:



Diff: 1

13) Propose a structure for the ether of formula $C_4H_{10}O$ with the following 1H NMR signals:
 δ 1.20 (triplet, 6H), δ 3.45 (quartet, 4H) (ppm).

Answer: $CH_3CH_2OCH_2CH_3$

Diff: 2

14) Propose a structure for the ether of formula $C_4H_{10}O$ with the following 1H NMR signals:
 δ 0.95 (triplet, 3H), 1.52 (multiplet, 2H), 3.30 (singlet, 3H), 3.40 (triplet, 2H) (ppm).

Answer: $CH_3CH_2CH_2OCH_3$

Diff: 2

15) Propose a structure for the ether of formula $C_4H_{10}O$ with the following 1H NMR signals:
 δ 1.13 (doublet, 6H), 3.30 (singlet, 3H), 3.65 (septet, 1H) (ppm).

Answer: $(CH_3)_2CHOCH_3$

Diff: 2

16) What is the chemical shift of the carbon bound to oxygen in ethers in ^{13}C NMR?

Answer: δ 65 to δ 90

Diff: 3

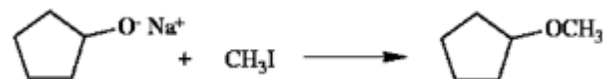
17) The Williamson ether synthesis occurs by the _____ mechanistic pathway.

Answer: S_N2

Diff: 1

18) Show the best method for preparing methoxycyclopentane via the Williamson ether synthesis.

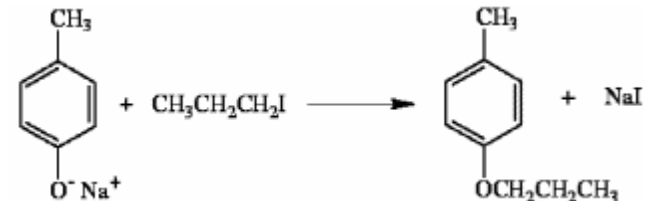
Answer:



Diff: 1

19) Show the best method for preparing 4-propoxytoluene via the Williamson ether synthesis.

Answer:



Diff: 2

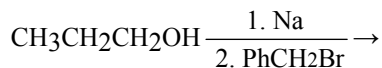
20) Which pair of reagents would produce the highest yield of (*R*)-2-ethoxybutane?

- A) sodium (*S*)-2-butoxide + iodoethane
- B) sodium (*R*)-2-butoxide + iodoethane
- C) sodium ethoxide + (*S*)-2-iodobutane
- D) sodium ethoxide + (*R*)-2-iodobutane
- E) Both B and C would work equally well.

Answer: B

Diff: 2

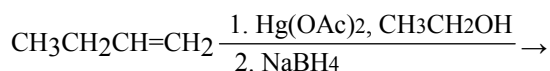
21) Provide the major organic product in the reaction below.



Answer: $\text{CH}_3\text{CH}_2\text{CH}_2\text{OCH}_2\text{Ph}$

Diff: 1

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



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



Diff: 2

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

Answer: 1. NaOCH_3

2. $\text{Hg}(\text{OAc})_2, \text{CH}_3\text{CH}_2\text{OH}$

3. NaBH_4

or

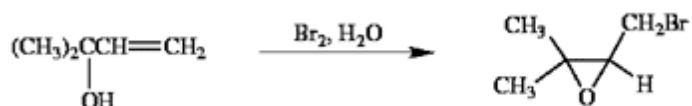
1. H_2O , heat

2. Na

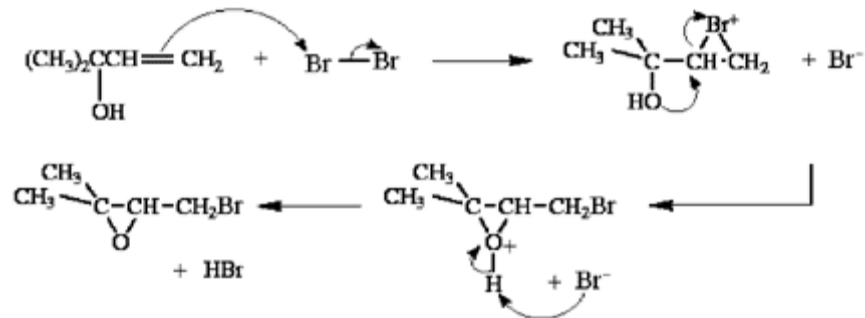
3. $\text{CH}_3\text{CH}_2\text{I}$

Diff: 2

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

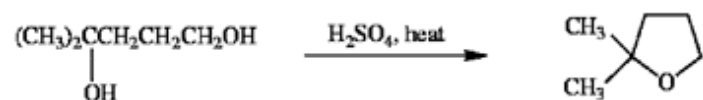


Answer:

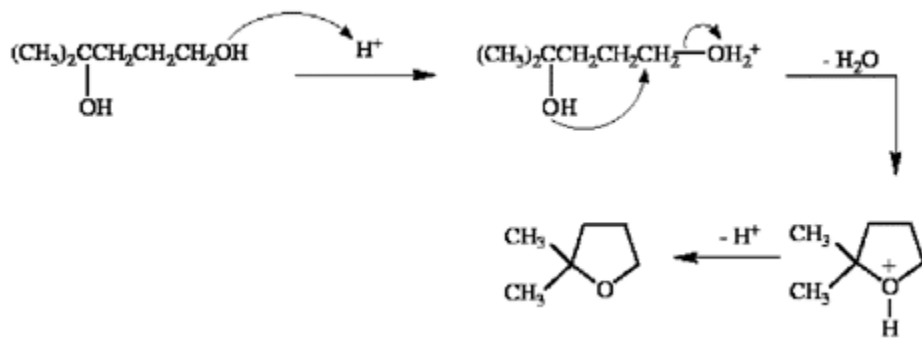


Diff: 2

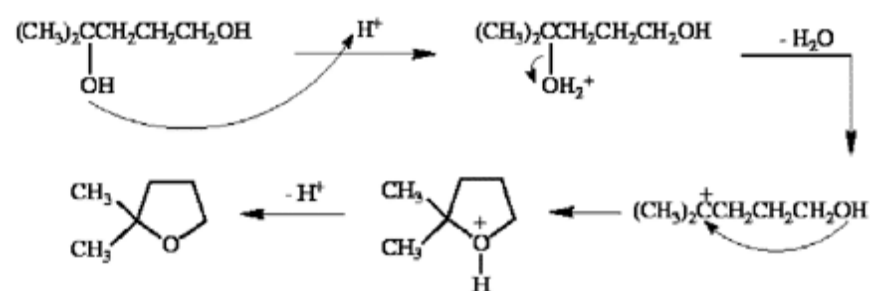
25) Suggest a reasonable mechanism for the reaction shown below.



Answer:

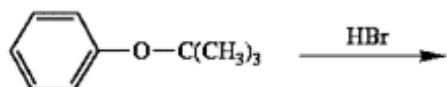


or

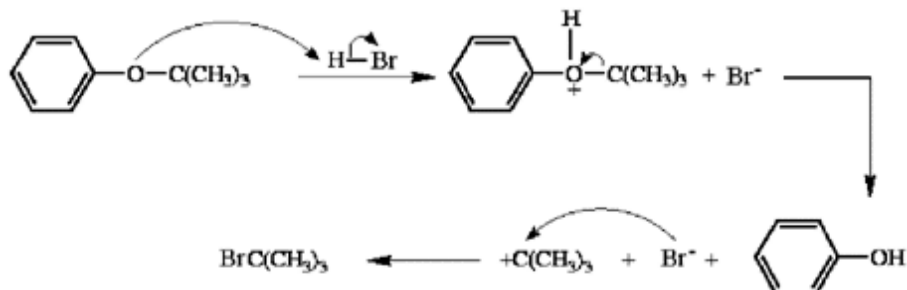


Diff: 2

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



Answer:



Diff: 2

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

Answer: 1. Secondary alcohols tend to yield alkenes under these conditions.

2. Symmetrical ethers would be produced as well.

Diff: 2

28) When hexan-1-ol is treated with conc. H_2SO_4 at moderate temperatures, _____ is formed via a(n) _____ mechanism.

A) di-*n*-hexyl ether, $\text{S}_{\text{N}}2$

B) di-*n*-hexyl ether, $\text{S}_{\text{N}}1$

C) di-*n*-hexyl ether, E2

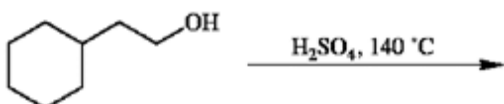
D) di-*n*-propyl ether, E1

E) hex-1-ene, $\text{S}_{\text{N}}1$

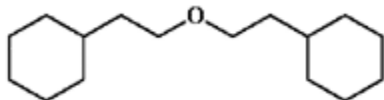
Answer: A

Diff: 2

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

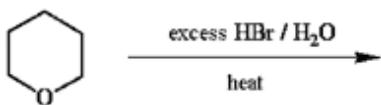


Answer:



Diff: 2

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

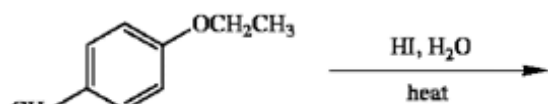


Answer:

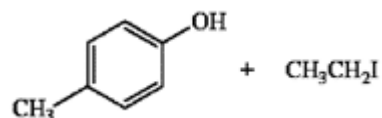


Diff: 3

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



Answer:



Diff: 1

32) Di-*n*-pentyl ether can be converted to 1-bromopentane by treatment with HBr through essentially a(n) _____ mechanism.

- A) S_N2
- B) S_N1
- C) E2
- D) E1
- E) ring opening

Answer: A

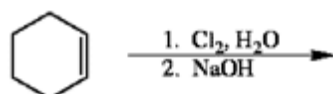
Diff: 1

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

Answer: hydroperoxides or dialkylperoxides

Diff: 2

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

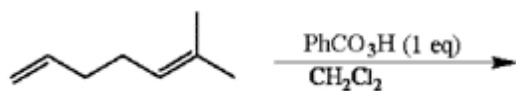


Answer:

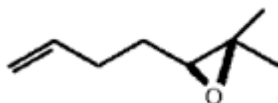


Diff: 1

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

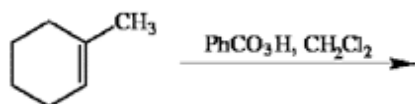


Answer:

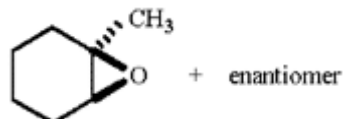


Diff: 2

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



Answer:



Diff: 1

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



Answer:



Diff: 3

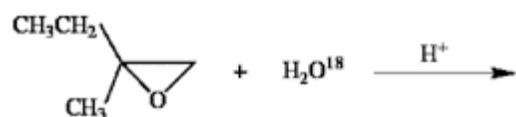
38) When trans-hex-3-ene is treated with PhCO_3H , the major organic product is:

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

Answer: B

Diff: 2

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

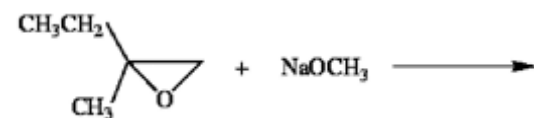


Answer:

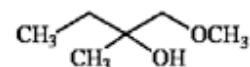


Diff: 3

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

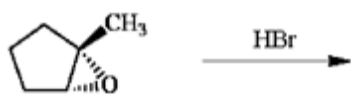


Answer:

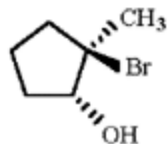


Diff: 2

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

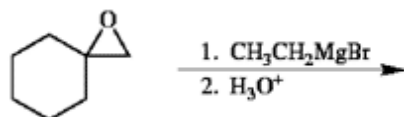


Answer:

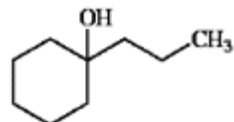


Diff: 3

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

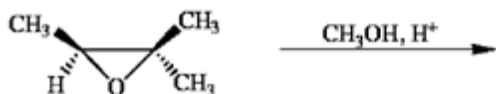


Answer:

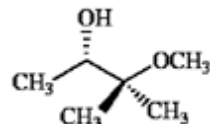


Diff: 2

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



Answer:



Diff: 2

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

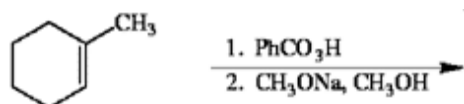
(1) $\text{Cl}_2, \text{H}_2\text{O}$, (2) NaOH , (3) H_3O^+ ?

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

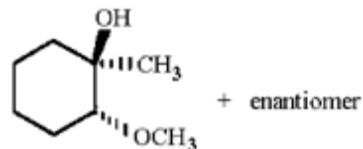
Answer: D

Diff: 3

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



Answer:



Diff: 2

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

Answer: meso

Diff: 2

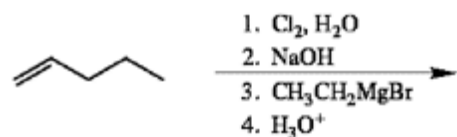
47) What are the expected products of the reaction of PhOCH_3 with concentrated HI ?

- A) phenol and methanol
- B) phenol and iodomethane
- C) iodobenzene and methanol
- D) iodobenzene and iodomethane

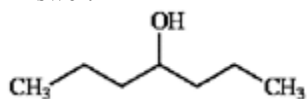
Answer: B

Diff: 1

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

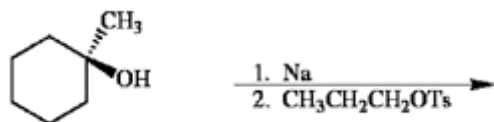


Answer:

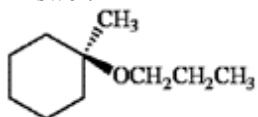


Diff: 2

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

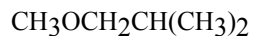


Answer:



Diff: 1

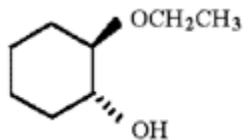
52) Provide an acceptable name for the compound shown below.



Answer: isobutyl methyl ether or 1-methoxy-2-methylpropane

Diff: 2

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



Answer: *trans*-2-ethoxycyclohexan-1-ol

Diff: 2

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

Answer: 1. PhCO_3H

2. LiAlD_4

Diff: 3

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

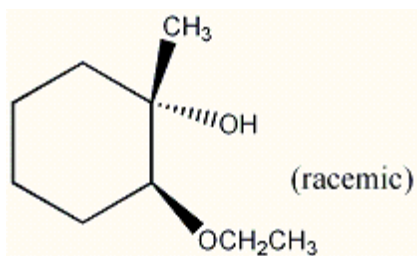
Answer: 1. Mg, ether

2. oxirane

3. H_3O^+

Diff: 2

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



Answer: 1. CH₃MgBr

2. conc. H₂SO₄

3. PhCO₃H

4. H⁺, CH₃CH₂OH

Diff: 3

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

Answer: 1. Hg(OAc)₂, CH₃CH₂OH

2. NaBH₄

Diff: 1

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

Answer: 1. CH₃MgBr

2. conc. H₂SO₄

3. PhCO₃H

Diff: 2

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

Answer: 1. PhCO₃H

2. H₃O⁺

Diff: 1

65) When pent-1-ene is treated with mercury(II) acetate in methanol and the resulting product is reacted with NaBH_4 , what is the primary organic compound which results?

- A) 3-ethoxypentane
- B) 1-methoxypentane
- C) 1-ethoxypentane
- D) 2-ethoxypentane
- E) 2-methoxypentane

Answer: E

Diff: 2

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

Answer: sulfides or thioethers

Diff: 1

69) Which of the following is produced by the reaction of $(\text{CH}_3\text{CH}_2)_2\text{S}$ with $\text{CH}_3\text{CH}_2\text{I}$?

- A) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{I}$
- B) $(\text{CH}_3\text{CH}_2)_3\text{S}^+ \text{I}^-$
- C) $(\text{CH}_3\text{CH}_2)_3\text{S}$
- D) $\text{CH}_3\text{SCH}_2\text{CH}_2\text{CH}_3$
- E) $\text{CH}_3\text{CH}_2\text{SCH}_2\text{CH}_2\text{I}$

Answer: B

Diff: 2

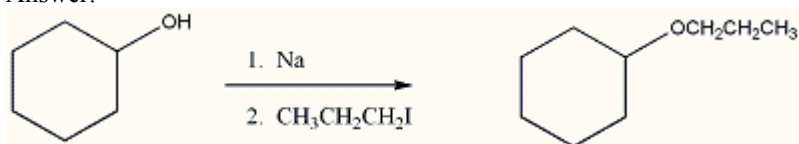
70) Why are sulfonium salts good alkylating agents?

Answer: Sulfonium salts are good alkylating agents because the leaving group is an uncharged sulfide.

Diff: 2

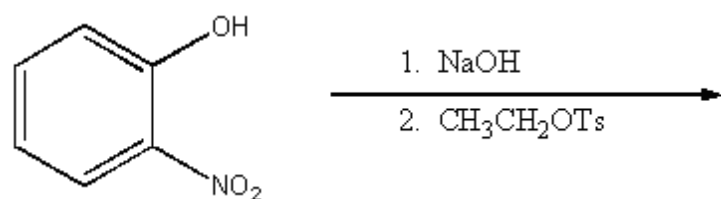
73) Provide the sequence of reactions by which propoxycyclohexane can be prepared through a Williamson ether synthesis.

Answer:

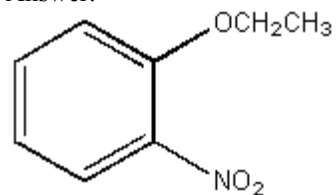


Diff: 2

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

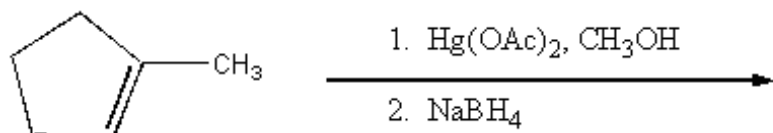


Answer:

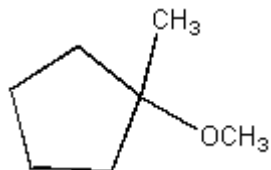


Diff: 2

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

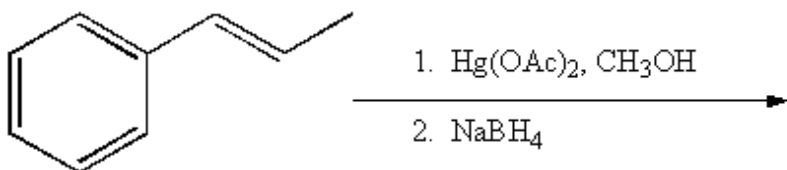


Answer:

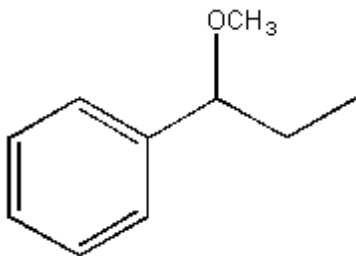


Diff: 2

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

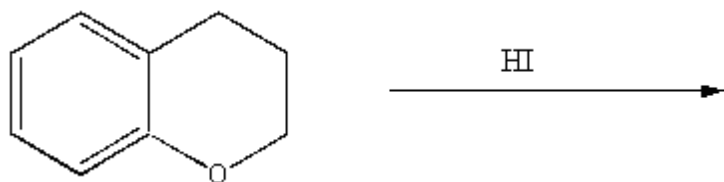


Answer:

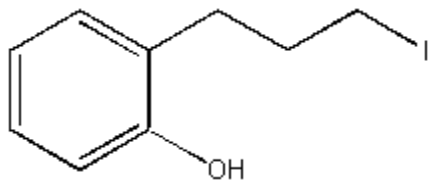


Diff: 2

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

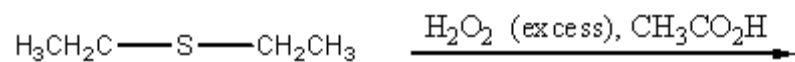


Answer:

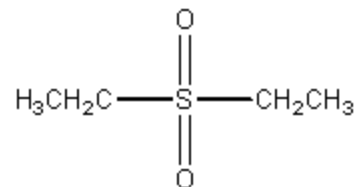


Diff: 2

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

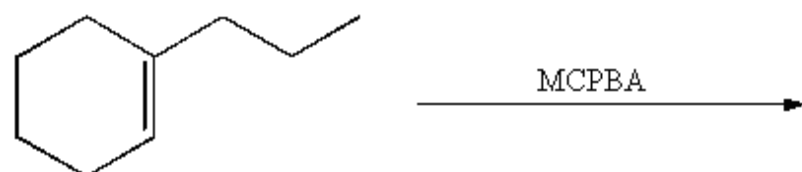


Answer:

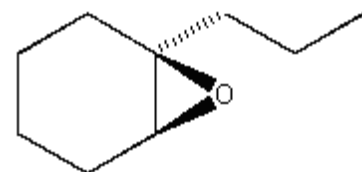


Diff: 2

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

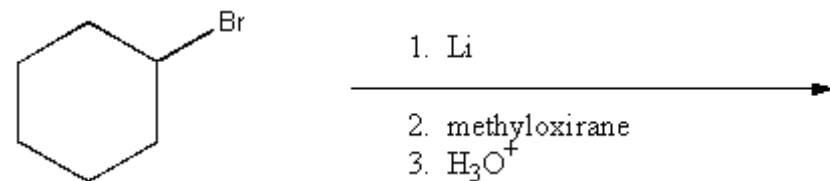


Answer:

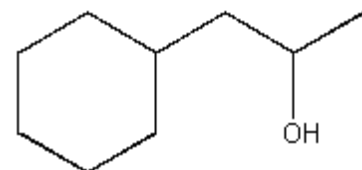


Diff: 2

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



Answer:



Diff: 2

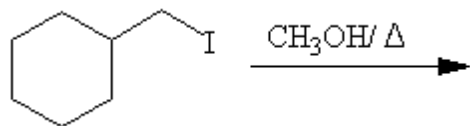
85) Through what mechanisms can a 1,2-halohydrin be converted into an epoxide?

- A) S_N1
- B) S_N2
- C) E2
- D) electrophilic addition
- E) polymerization

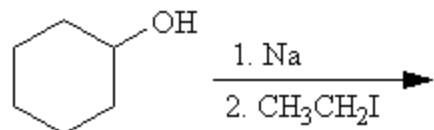
Answer: B

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

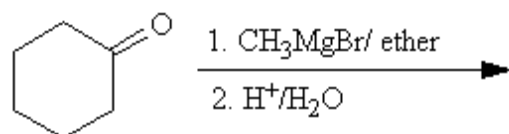
A)



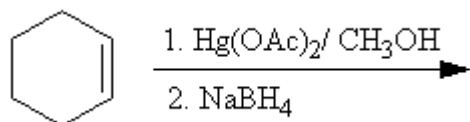
B)



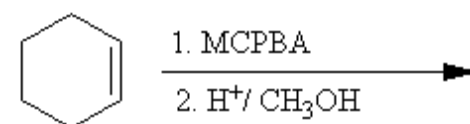
C)



D)



E)

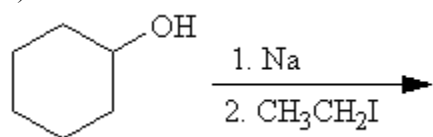


Answer: B

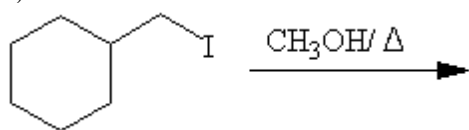
Diff: 2

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

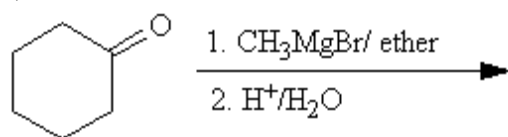
A)



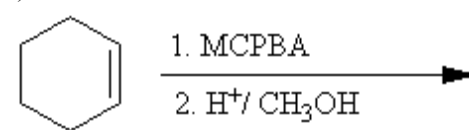
B)



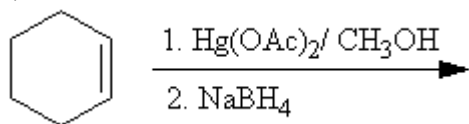
C)



D)



E)

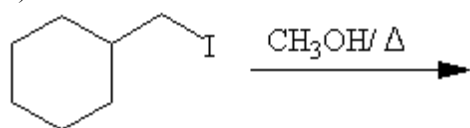


Answer: D

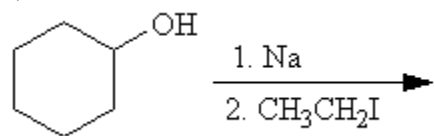
Diff: 2

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

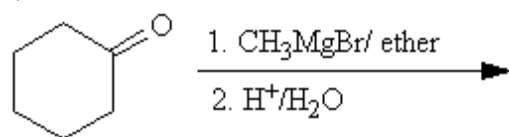
A)



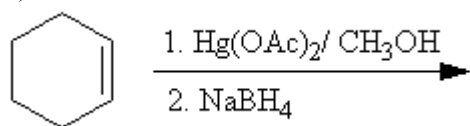
B)



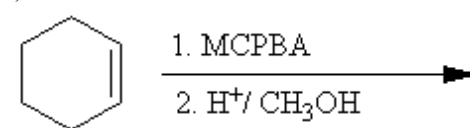
C)



D)



E)



Answer: D

Diff: 2