

Chapter 20: More about Oxidation-Reduction Reactions

Learning Objectives:

1. Be able to predict products from reductions.
2. Be able to predict products from oxidation of alcohol, aldehydes, ketones, and alkenes.
3. Be able to predict products from hydroxylation of alkenes along with the associated stereochemistry.
4. Be able to predict products from oxidative cleavage of 1,2-diols, alkenes, and alkynes.
5. Be able to write the general electron-pushing (arrow-pushing) mechanisms of ozonolysis and Baeyer-Villiger reaction.
6. Be able to employ the reactions taught in Chem2310 and Chem2320 for multiple step synthesis and functional group interconversion.

Sections:

- 20.1 Reduction Reactions*
- 20.2 Oxidation of Alcohols*
- 20.3 Oxidation of Aldehydes and Ketones*
- 20.4 Oxidation of Alkenes with Peroxyacids
- 20.5 Designing a Synthesis VII: Controlling Stereochemistry[#]
- 20.6 Hydroxylation of Alkenes
- 20.7 Oxidative Cleavage of 1,2-Diols
- 20.8 Oxidative Cleavage of Alkenes
- 20.9 Oxidative Cleavage of Alkynes[#]
- 20.10 Designing a Synthesis VII: Functional Group Interconversion
- 20.11 Biological Oxidation-Reduction Reaction[#]
- 20.12 Oxidation of Hydroquinones and Reduction of Quinones[#]

* Sections that will be focused

[#] Sections that will be skipped

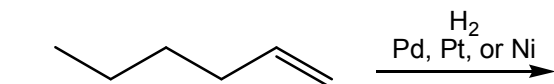
Recommended additional problems

20.34 – 20.42, 20.44 – 20.53, 20.60 – 20.65

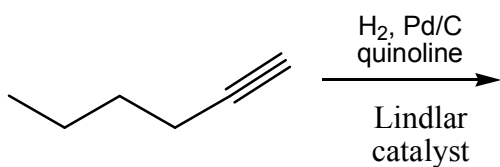
Class Note

20.1 Reduction Reactions

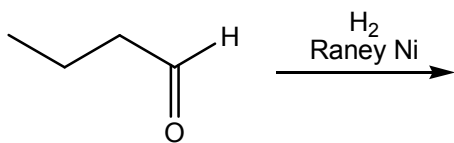
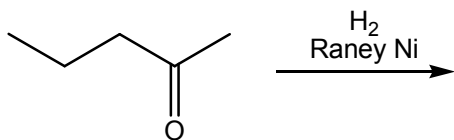
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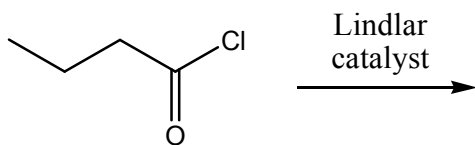
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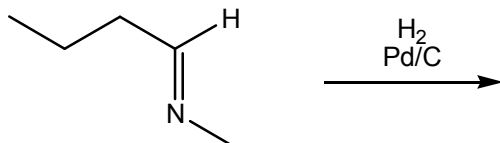
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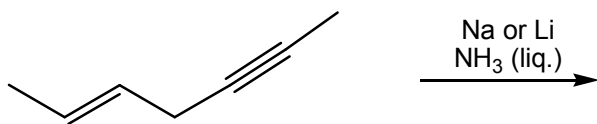
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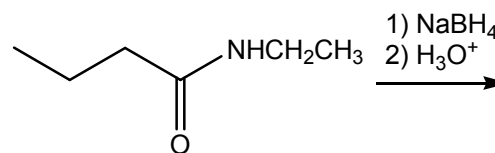
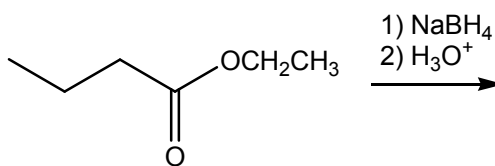
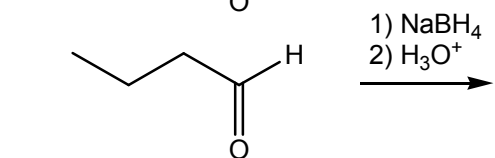
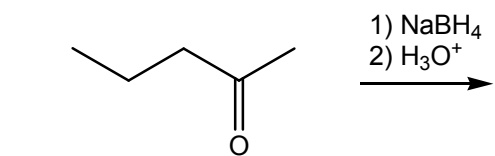
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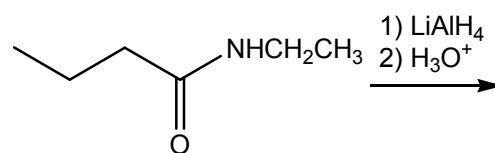
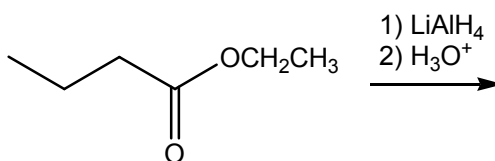
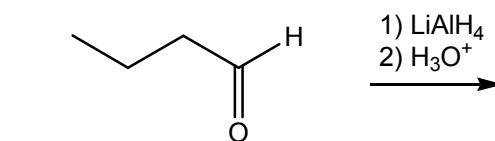
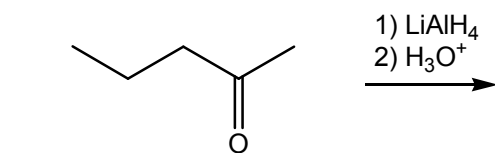
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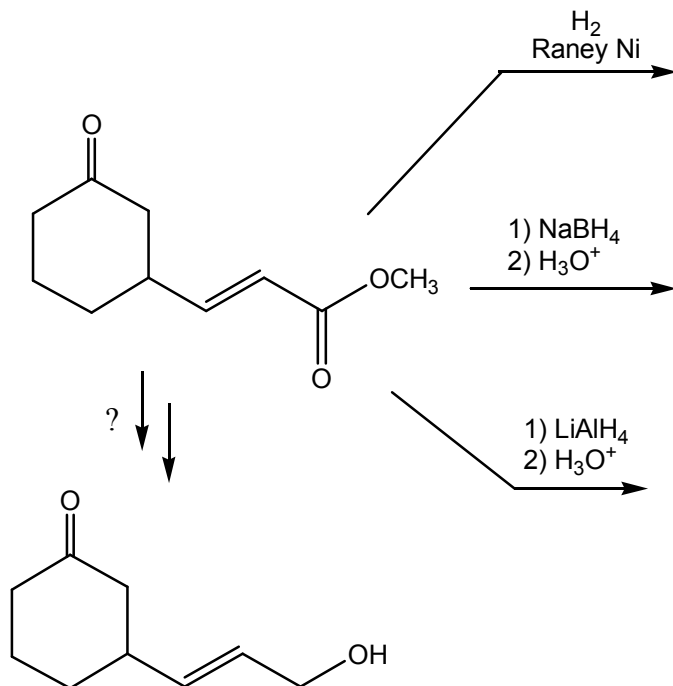
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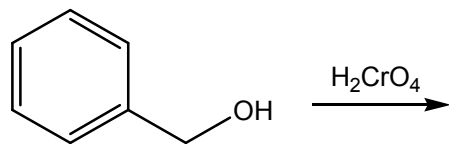
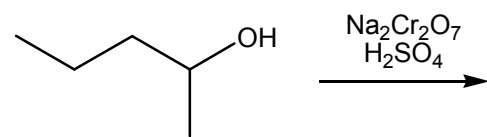
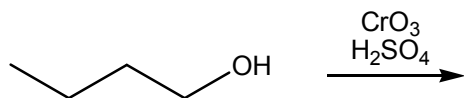


I.

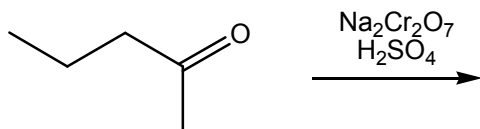
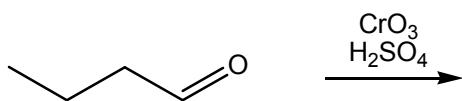


20.2 Oxidation of Alcohols and 20.3 Oxidation of Aldehydes and Ketones

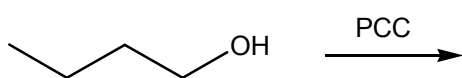
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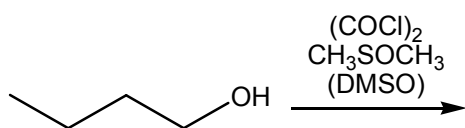
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C.

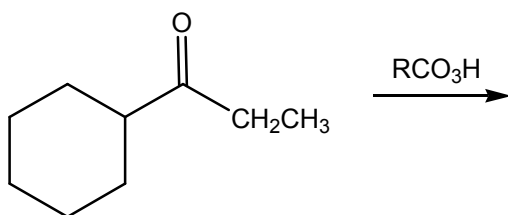
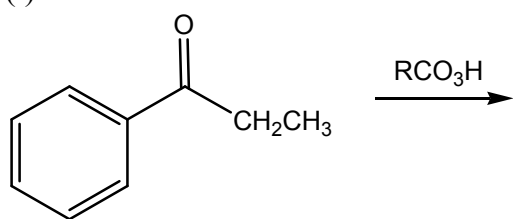


D. Swern oxidation



E. Baeyer-Villiger oxidation

(i)



(ii) Mechanism

(iii) Relative migration tendency

$\text{H} > 3^\circ \text{ alkyl} > 2^\circ \text{ alkyl} > 1^\circ \text{ alkyl} > \text{methyl}$

20.4 Oxidation of Alkenes with Peroxyacids

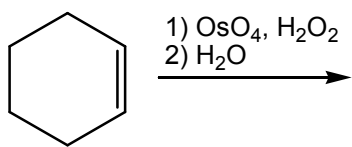
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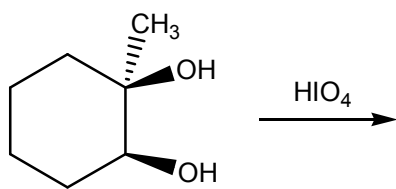
B. Mechanism

20.6 Hydroxylation of Alkenes and 20.7 Oxidative Cleavage of 1,2-Diols

A.

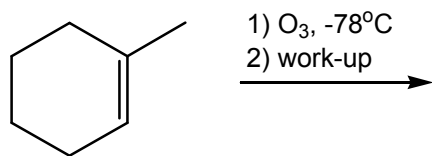


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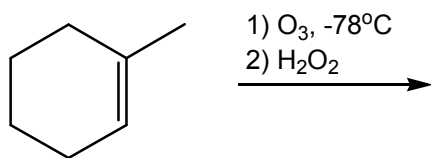
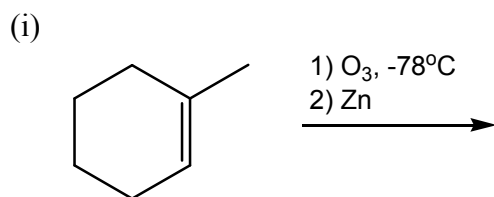
20.8 Oxidative Cleavage of Alkenes

A. Ozonolysis

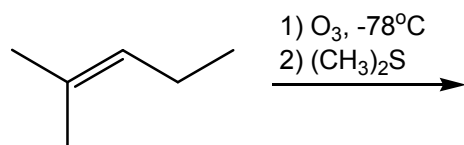
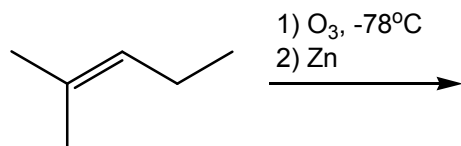


B. Mechanism of the first step

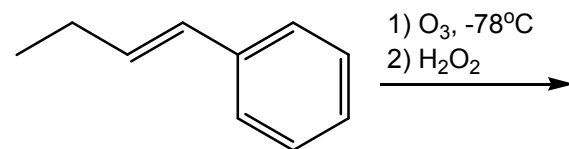
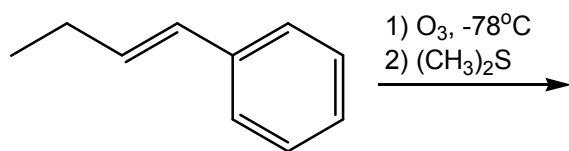
C. Examples



(ii)



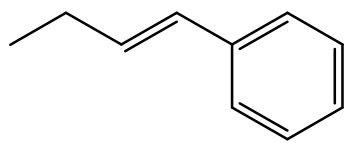
(iii)



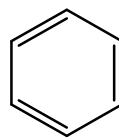
20.10 Designing a Synthesis VII: Functional Group Interconversion*

A.

synthesis

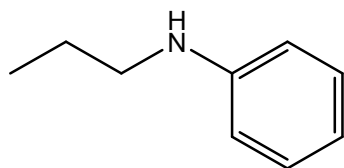


from



B.

synthesis



from

