ORGANIC CHEMISTRY 2 LECTURE GUIDE 2019

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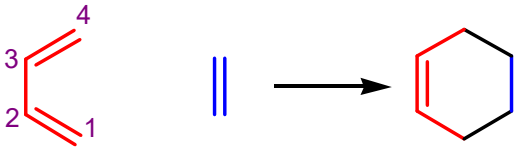
Lesson IV.3. Diels-Alder Reaction

A concerted cycloaddition reaction

The Diels-Alder reaction is a [4+2] cycloaddition reaction; it makes a six-membered ring from a diene that supplies 4 atoms and a dienophile that supplies 2 atoms:



diene ***dienophile***

This reaction can be classified as a 1,4-addition, because the dienophile adds to the 1 and 4 positions of the diene.

The mechanism of this reaction is very simple and it is a concerted, pericyclic reaction:

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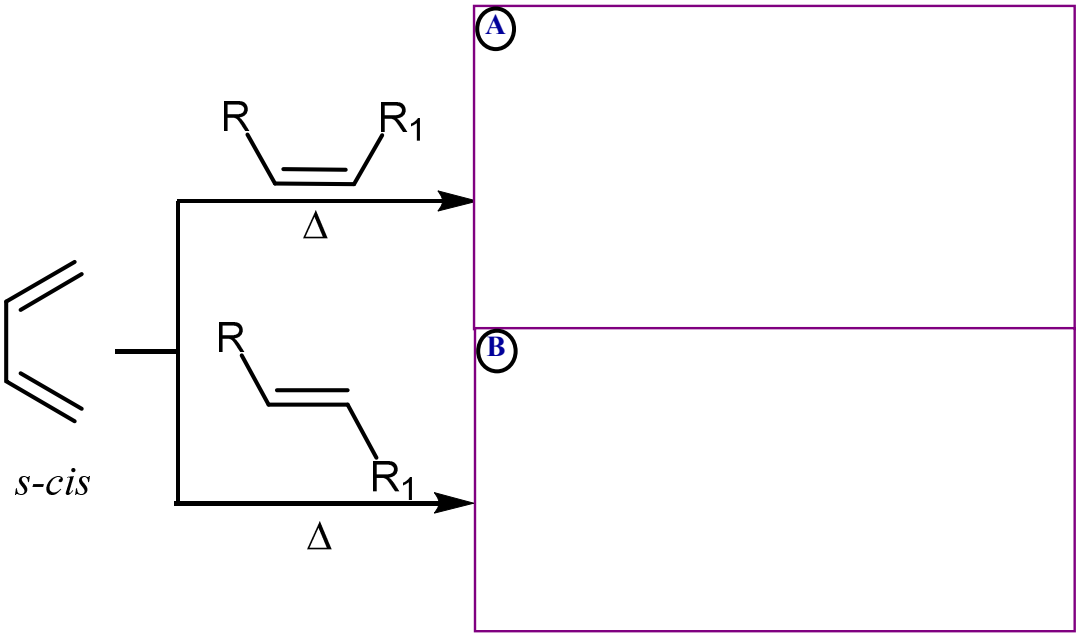
Notes

Lesson IV.3. Diels-Alder Reaction

Regiospecificity of Diels-Alder Reactions

One result of the concerted mechanism is that there is no rearrangement of starting materials in the course of the reaction, so the reaction is stereospecific:



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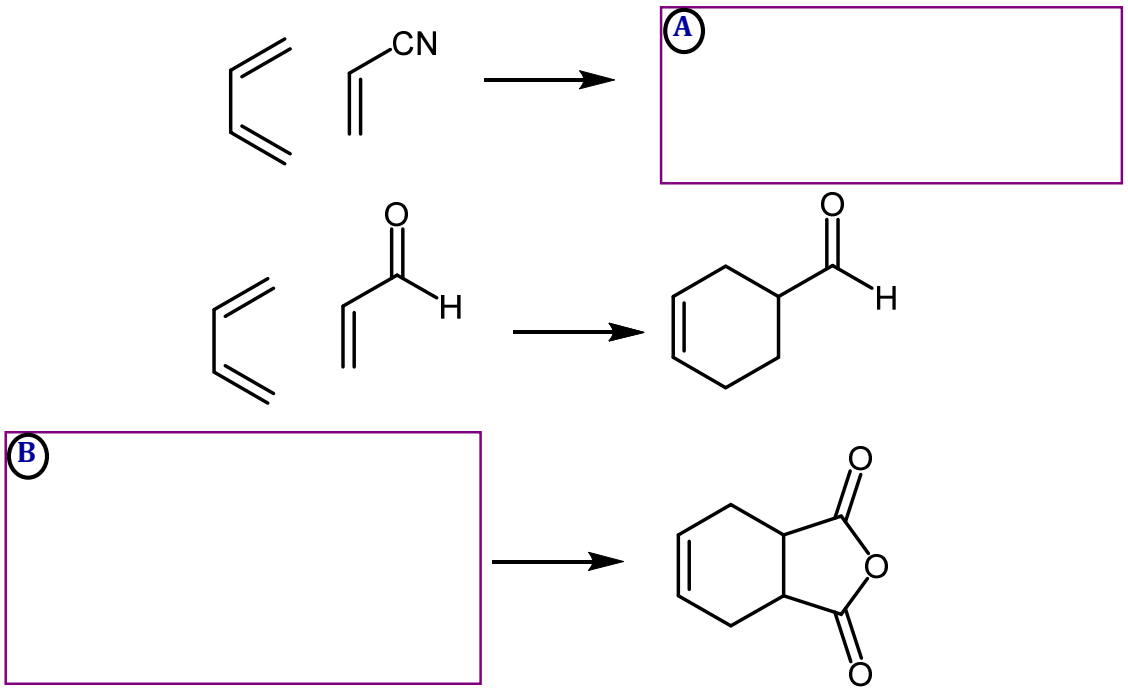
Lesson IV.3. Diels-Alder Reaction

Electron-Withdrawing Group Effect on Diels-Alder Reaction Rate

Diels –Alder reaction is facilitated by electron-poor dienophiles (dienophile substituted with an electron-withdrawing group):



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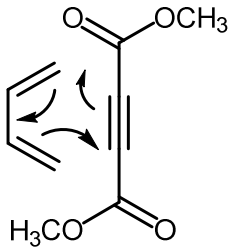
Lesson IV.3. Diels-Alder Reaction

Alkynes and Cyclic Reagents for Diels-Alder Reactions

The dienophile can also be an alkyne:



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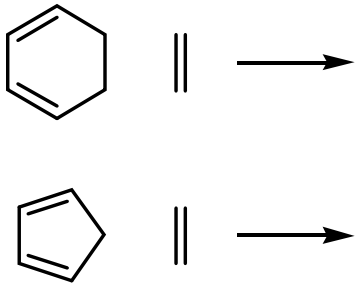
Cyclic compounds can be used as starting materials to create bridged bicyclic systems:



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