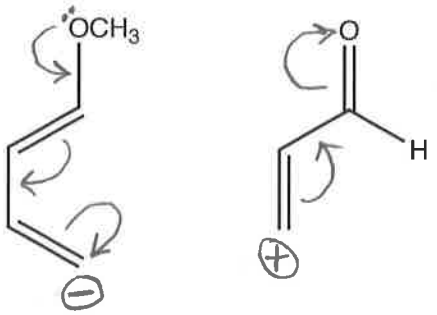
Conjugation #3: We Talking Rings—The Diels Alder Reaction

Yo, yo, yooooo. What's up my organic friends? Okay, so in my mind, Conjugated Systems has 2 parts. The first part we already covered—identifying molecules that exhibit conjugation and then how conjugation can alter the products we expect from reactions that involved charged/radical intermediates. The second part is the Diels Alder Reaction.

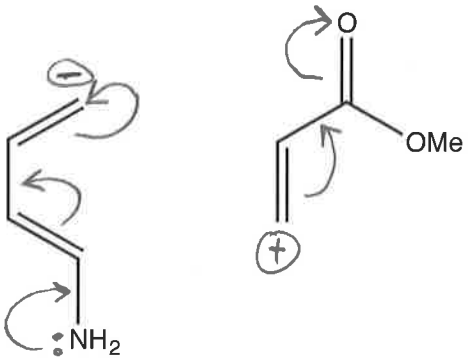
We're going to use 2 worksheets to fully cover the Diels Alder Reaction. In this one, we're going to become experts at predicting the product, practicing what we discussed in the last video.

1.) Before we get going with predicting the product of Diels Alder Rxns, I want to make sure you guys and gals are good with ensuring that the Diene and Dienophile are lined up correctly (remember we have to draw resonance to be certain the negative on the Diene will be matched with the positive on the Dienophile).

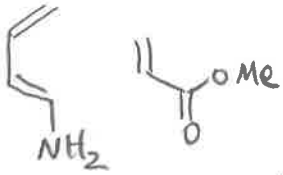
So draw the resonance, and indicate if the Diene/Dienophile pair match up. If not, flip one of the molecules and redraw the pair correctly aligned.

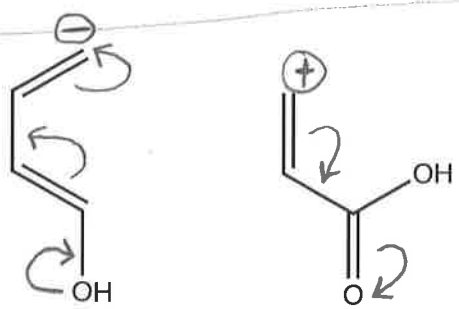


Lined up



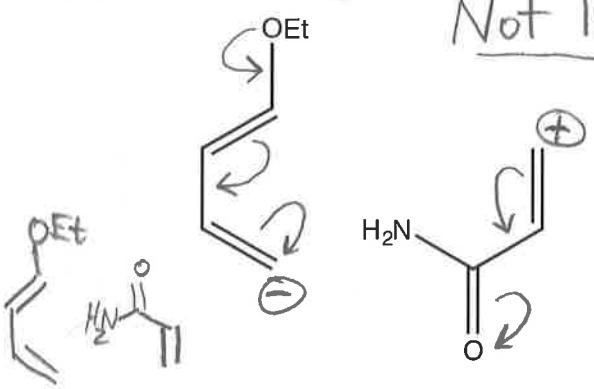
Not lined up





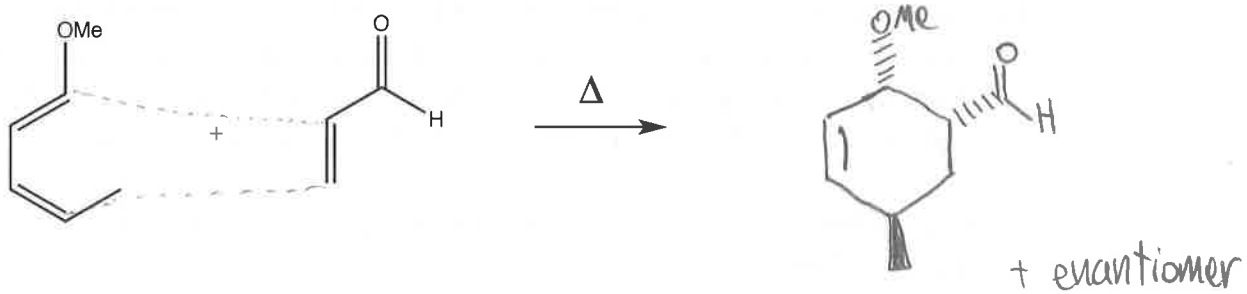
Lined up

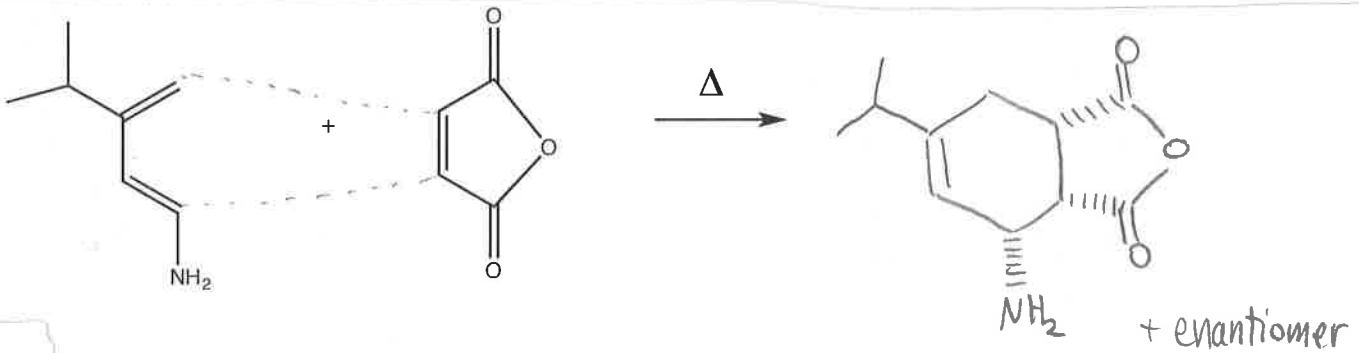
Not lined up

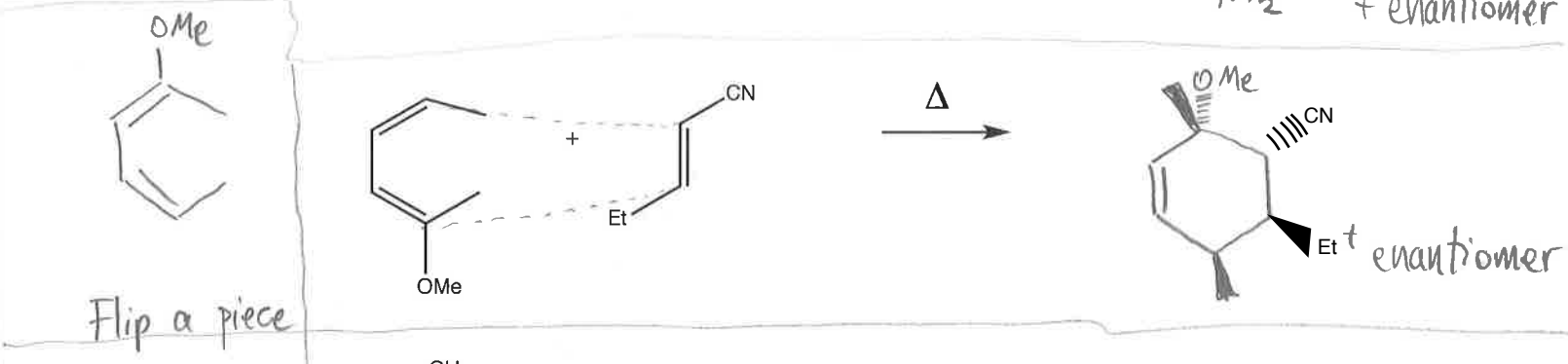


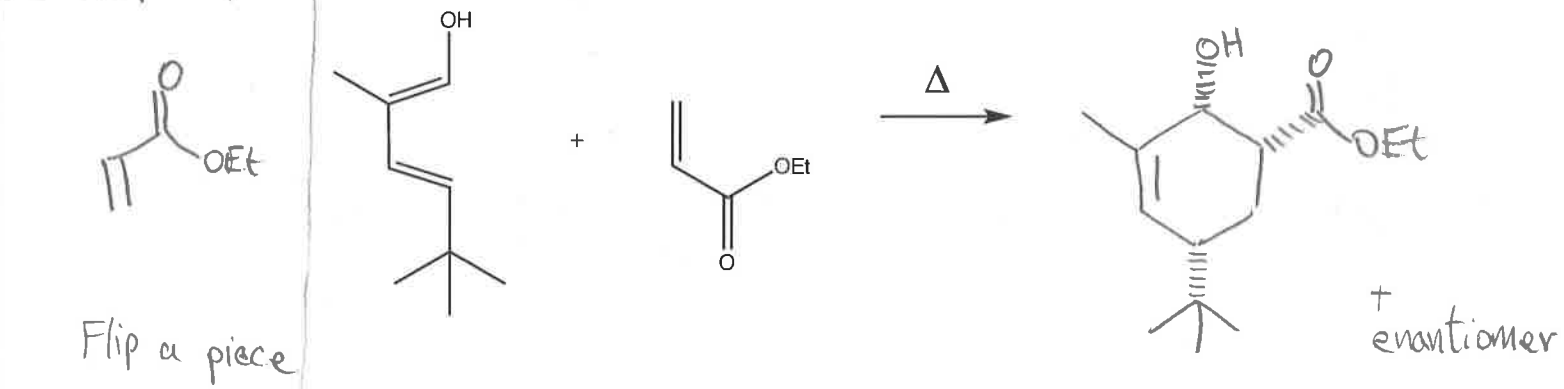
Okay, hopefully you dusted off your resonance skills and handled that easily. That's always your first move: Draw the resonance on the Diene/Dienophile and see if they are correctly aligned or if you have to flip one of the pieces. Then, the next step to **actually** predict the product is to connect the Diene and Dienophile and apply the "In/Out Group" Rule to determine the stereochemistry in the product. Recall that all "Out" groups end up on the same side of the ring, and all "In" groups end on the same side. But we already talked about it, so let's just do it, amirite?

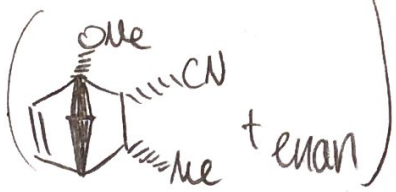
2.) Alrighty, so here's the deal. There is **no** guarantee the Diene/Dienophiles are aligned in the Complete the Reaction questions below. Ensure the pairs are aligned correctly and predict the product with the correct stereochemistry using the "In/Out Group" Rule.



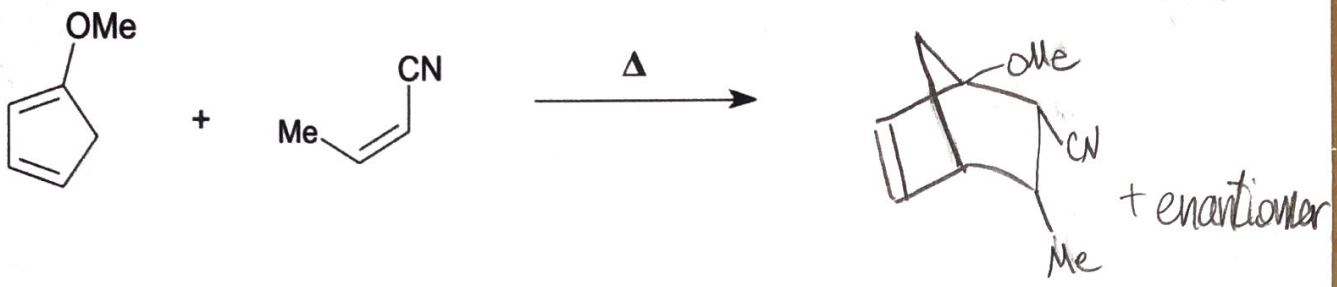


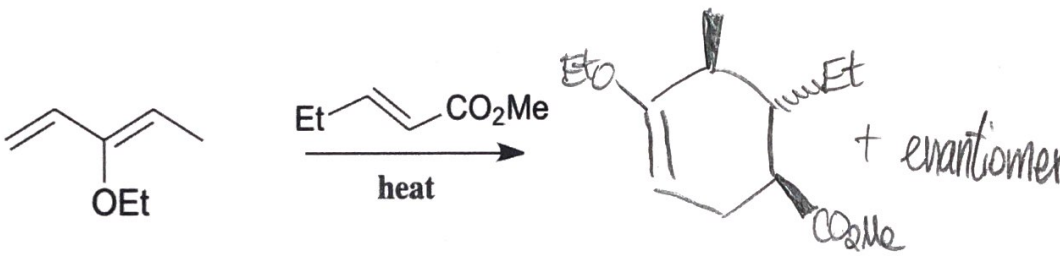


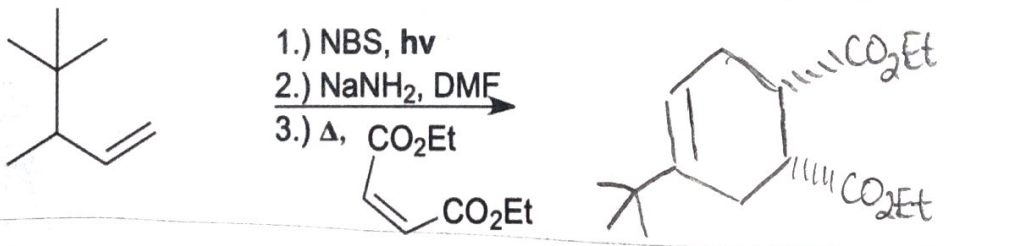


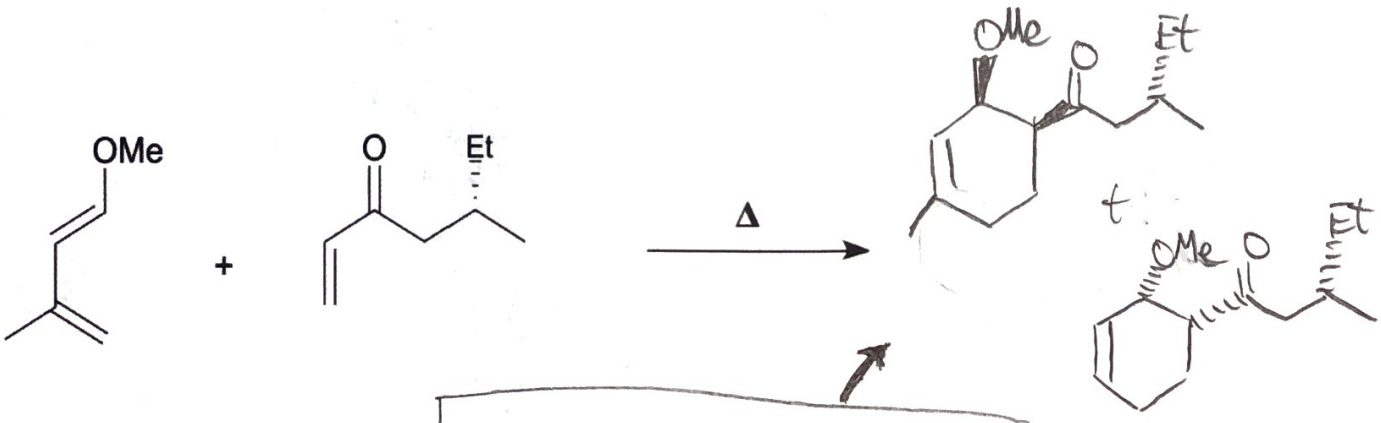


3.) Ok, gang. I have four more Diels-Alder CTR questions for you, and these are designed to be a wee bit harder than the ones above & expose you to some Diels-Alder "gotchas".









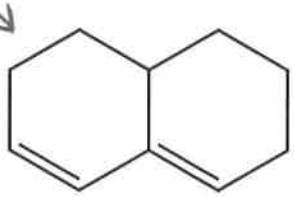
* Not a racemic mixture *

Okay, make sure you've got this down: The process is always drawing the resonance for the Diene/Dienophile, ensuring they match up, connecting the 2 pieces and forming the 6-membered ring that is characteristic of the Diels Alder, and then using the "Out/In Group" Rule to place all the "Out" groups on the same side of the ring as all other "Out" groups (and also doing same for the "In" groups).

Phew, that was a little bit of resonance and stereochem assigning. One last problem before we call it quits on predicting the products for Diels Alder Rxns.

3.) So in the last video, we mentioned that the Diene needs to have an S-cis conformation for the Diels Alder Reaction to work. Knowing that, explain why cyclohexa-1,3-diene is an **excellent** Diene while the naphthalene derivative **cannot** participate in a Diels Alder reaction.

cyclohexa-1,3-diene



1,2,3,7,8,8a-hexahydronaphthalene

In both structures, they are locked into place because they are rings.

locked in S-cis

locked in S-trans