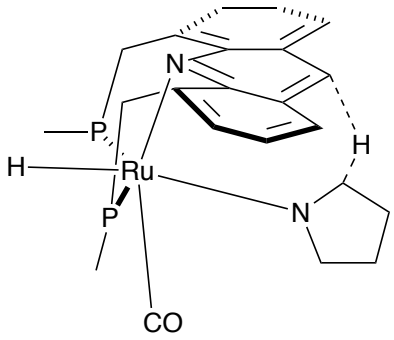
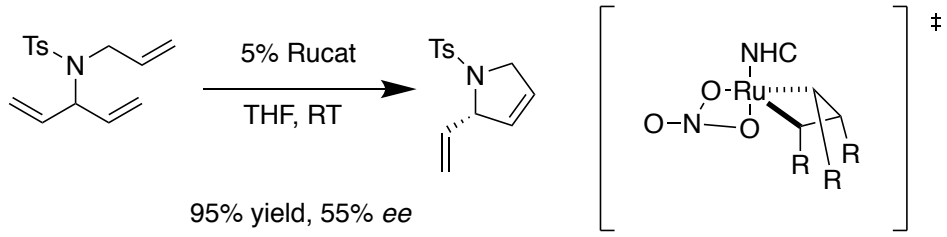
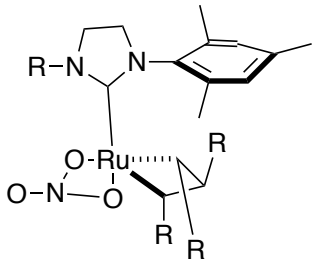
Answer Sheet

1. The key here is to notice that the pincer ligand can be either fac or mer, only the fac is catalytically active. More importantly the acridine core can be positioned to be in the plane with the pincer ligand or can be facing perpendicularly. If you draw the ligand in the fac perpendicular orientation you will see the C–H bond on the central ring of the acridine lies directly above the pyrolidine bound to the Ru. It looks like below. The rest of the reaction sequence proceeds by addition of water to the imine and a second dehydrogenation of the hemiaminal.

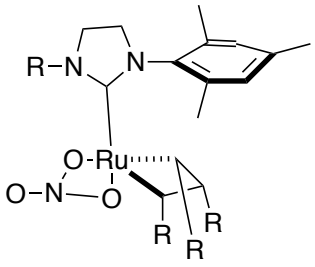


2. The product of the reaction and transition state is below



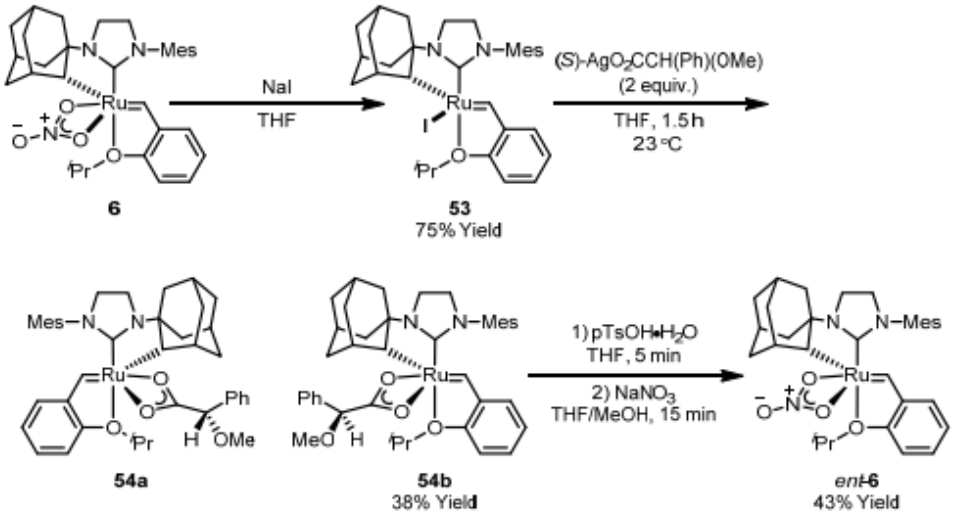


disfavored

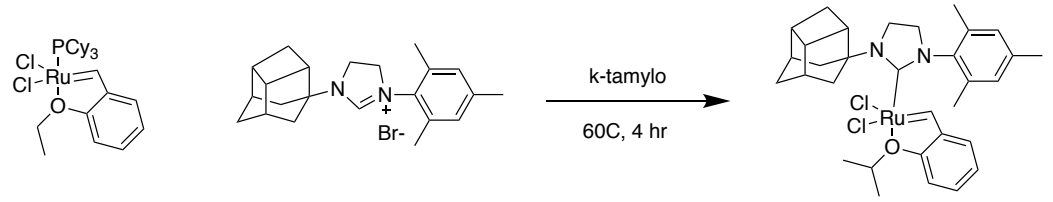


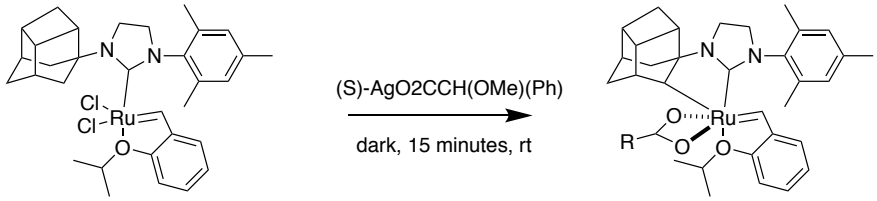
favored

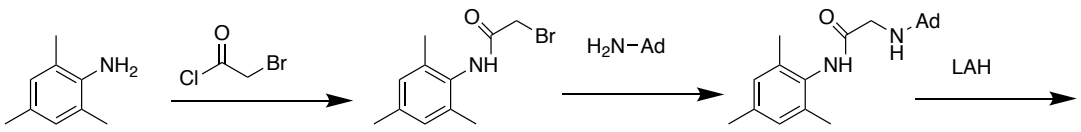
The synthesis of the catalyst is below

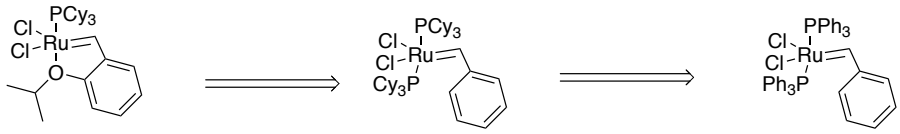


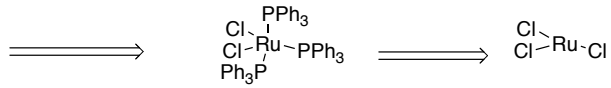
For the bonus there are a few possible routes, here is one that I like.



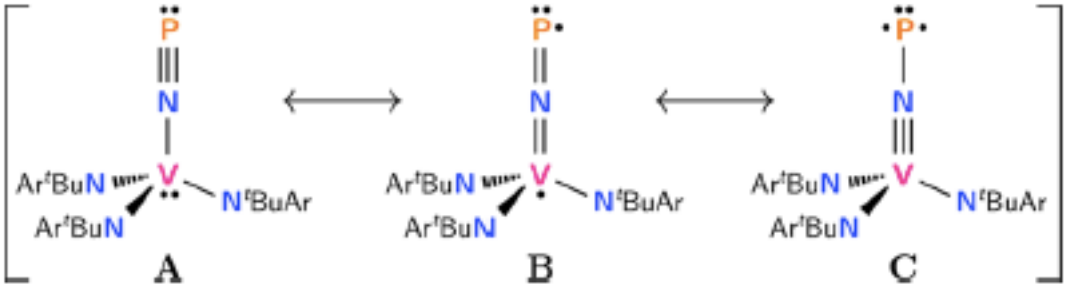


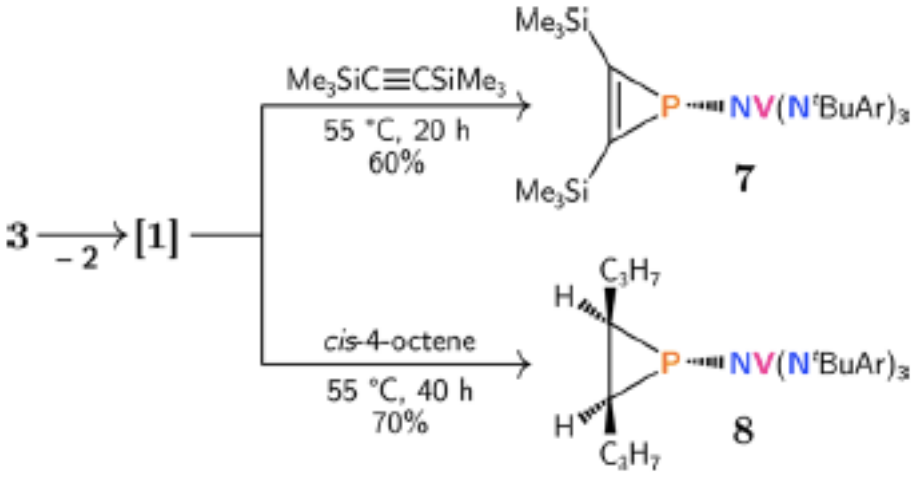


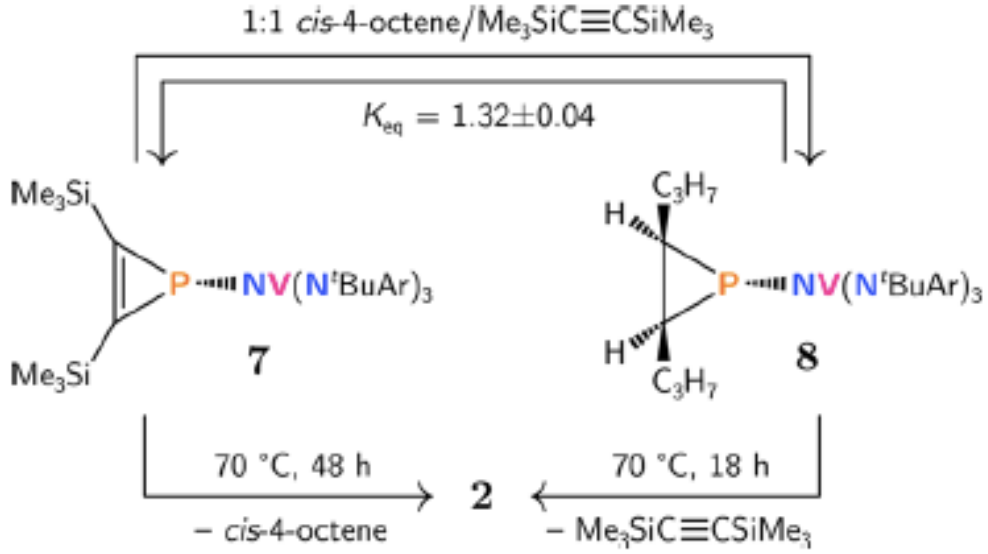




3. Answers below. 3 is trimer, 2 is dimer, 1 is monomer of catalyst. Because of the stereochemistry is not scrambled and the cyclopropane isn't opened they suggest that it reacts through A. C is predicted have singlet electrons instead of two lone pairs which also rules out this one.






1:1 cis-4-octene/Me3SiC≡CSiMe3
Keq = 1.32±0.04
Me3Si
P
NV(NtBuAr)3
Me3Si
7
C3H7
H
P
NV(NtBuAr)3
H
C3H7
8
70 °C, 48 h
– cis-4-octene
2
70 °C, 18 h
– Me3SiC≡CSiMe3