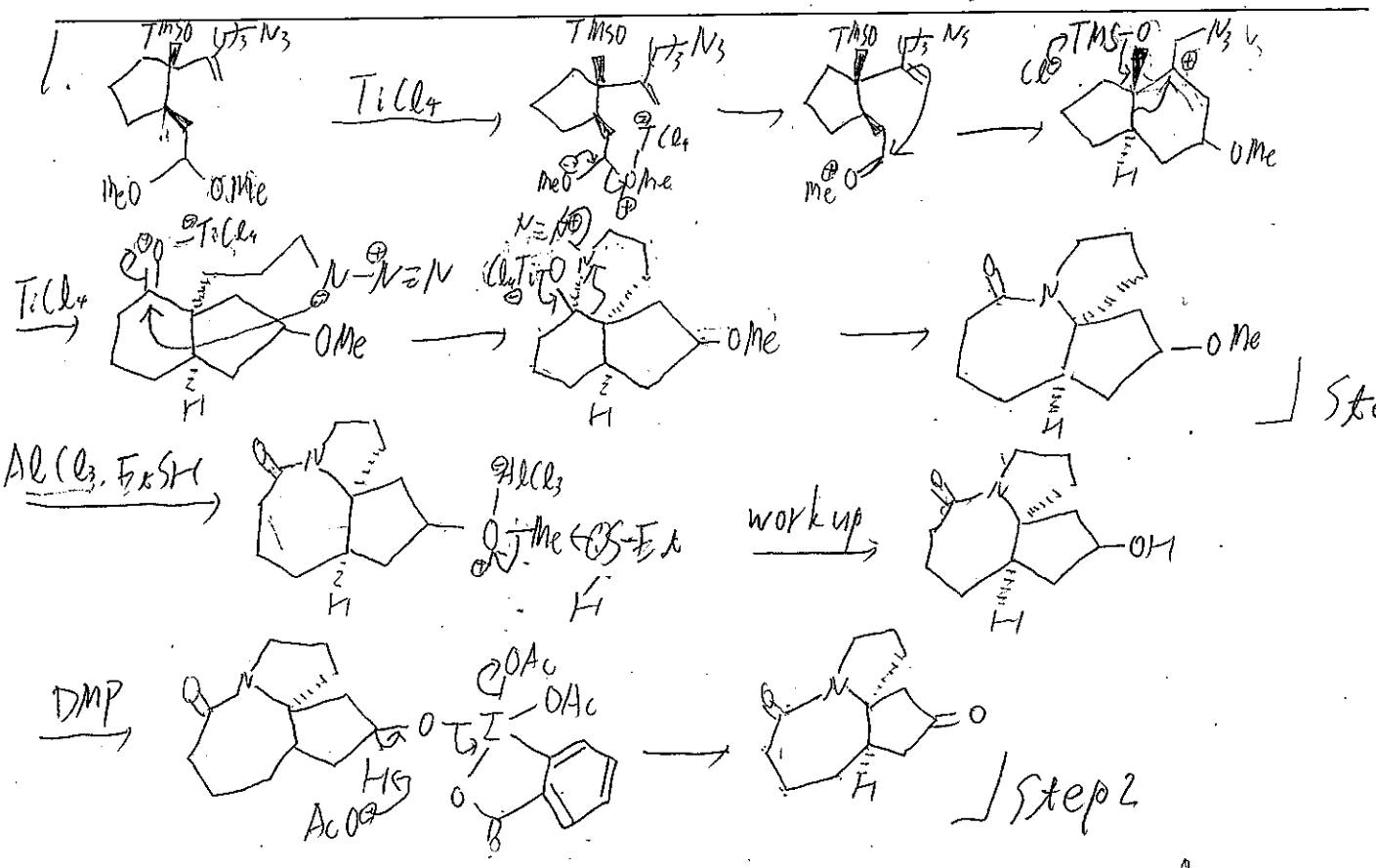
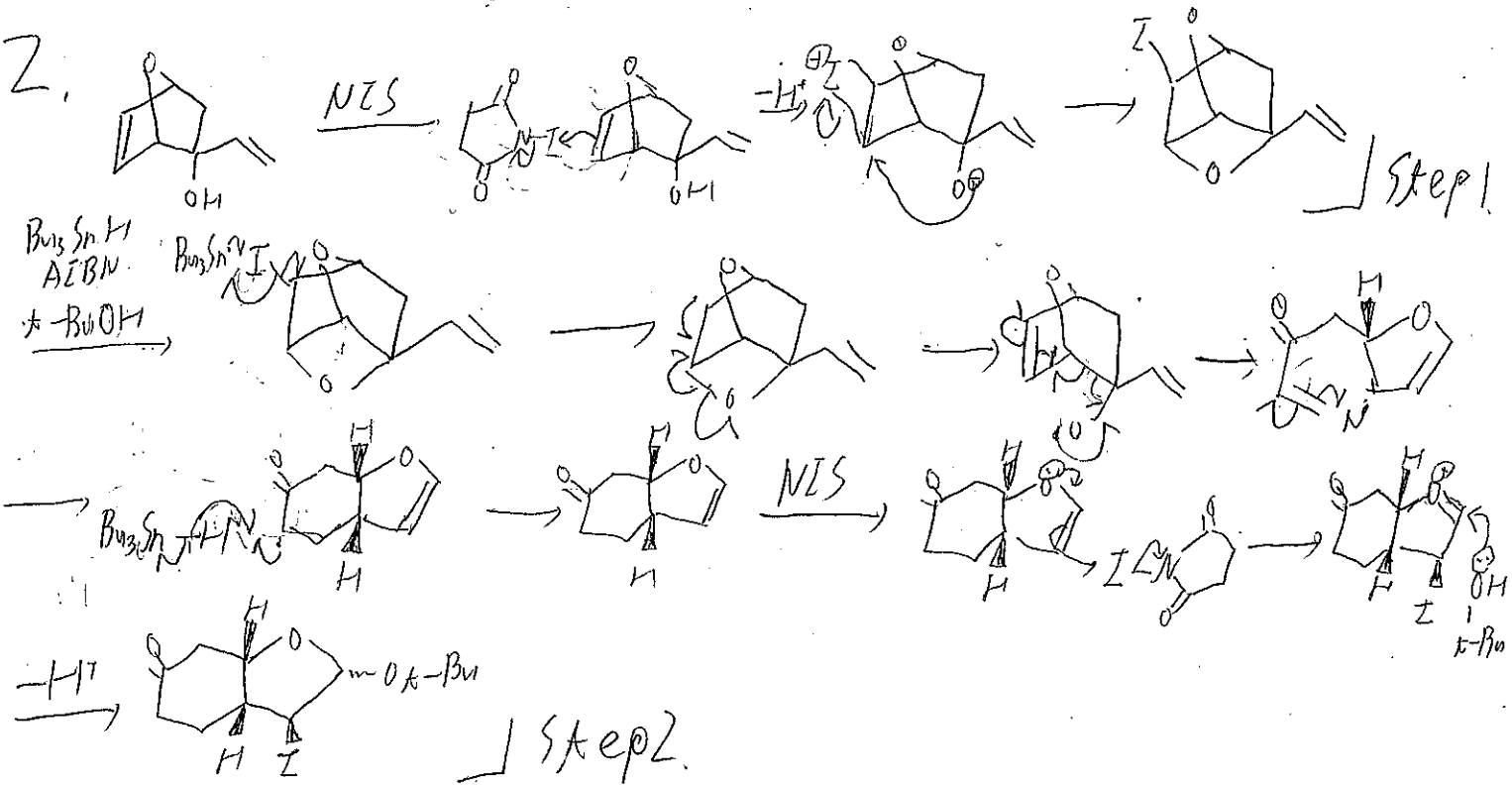
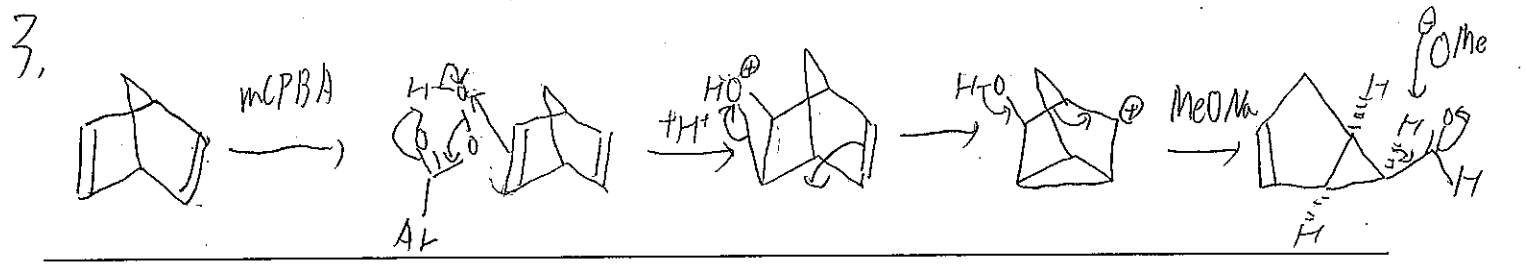
1.

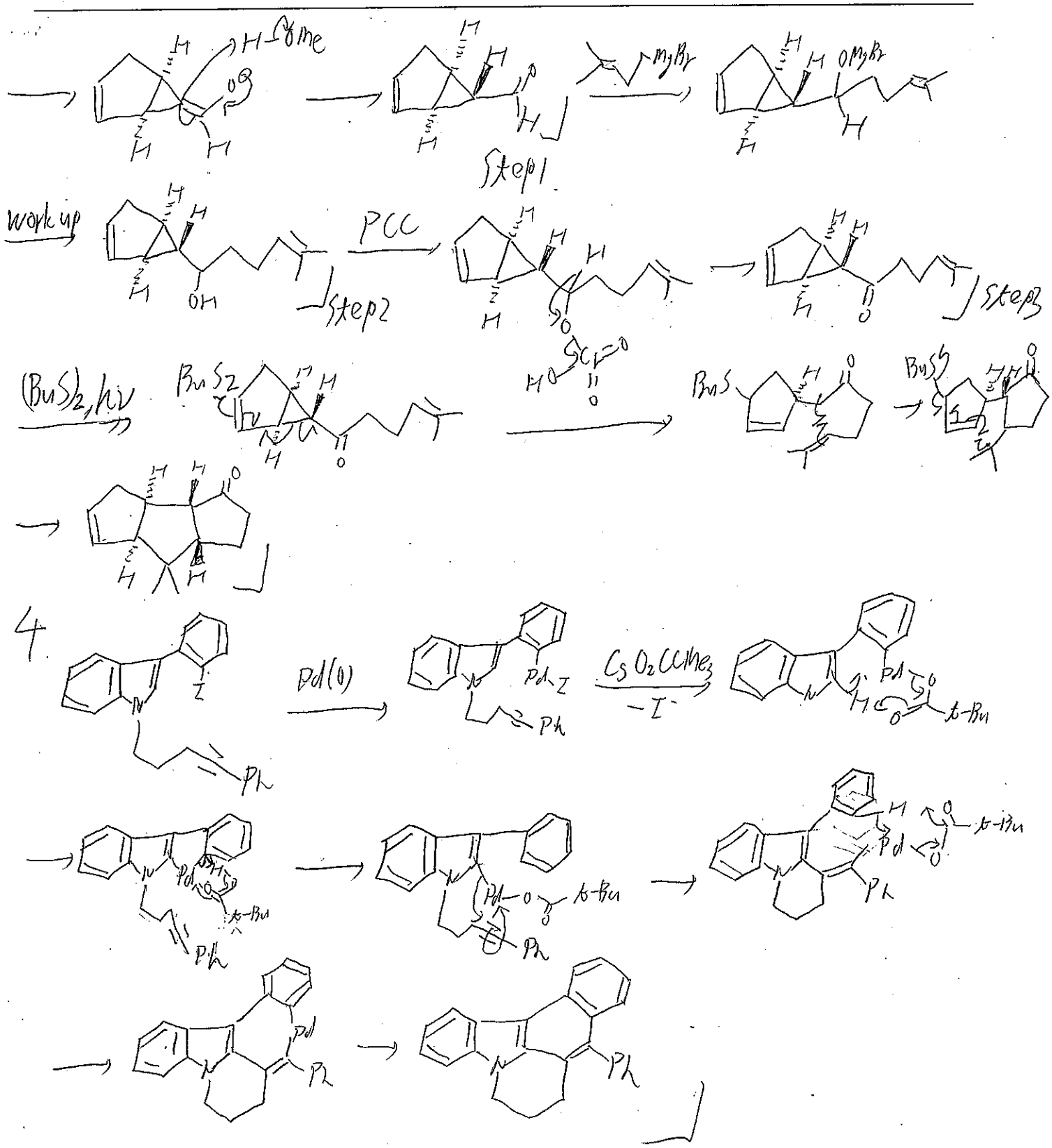

TiCl4
TiCl4
AlCl3, EtSH
work up
DMP
Step 1
Step 2

2.

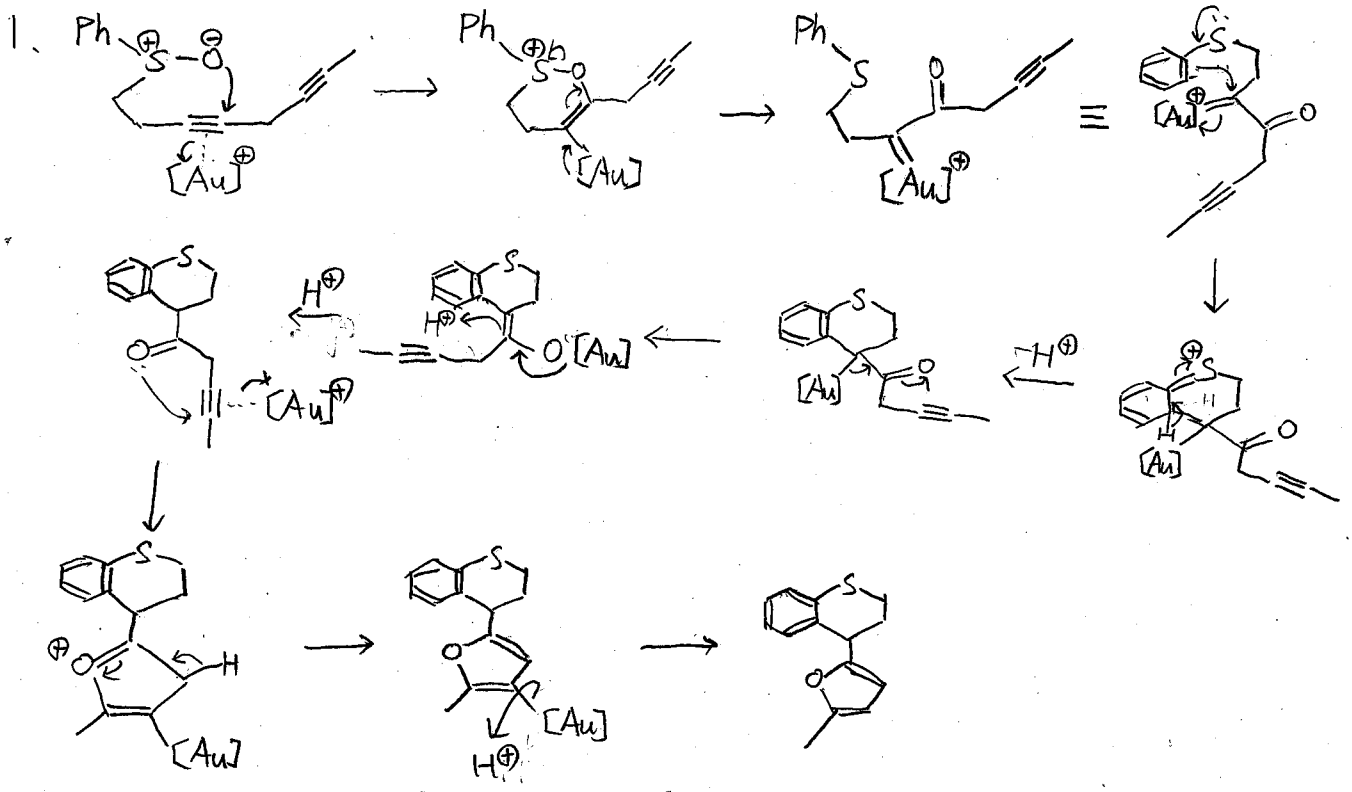

NIS
Bu3SnH
AIBN
t-BuOH
NIS
Step 1
Step 2

3.


mCPBA
MeONa


Step1
work up
Step2
PCC
Step3
(BuS)2, hν
4
Pd(0)
Cs O2 CCMe3
-I-

1.



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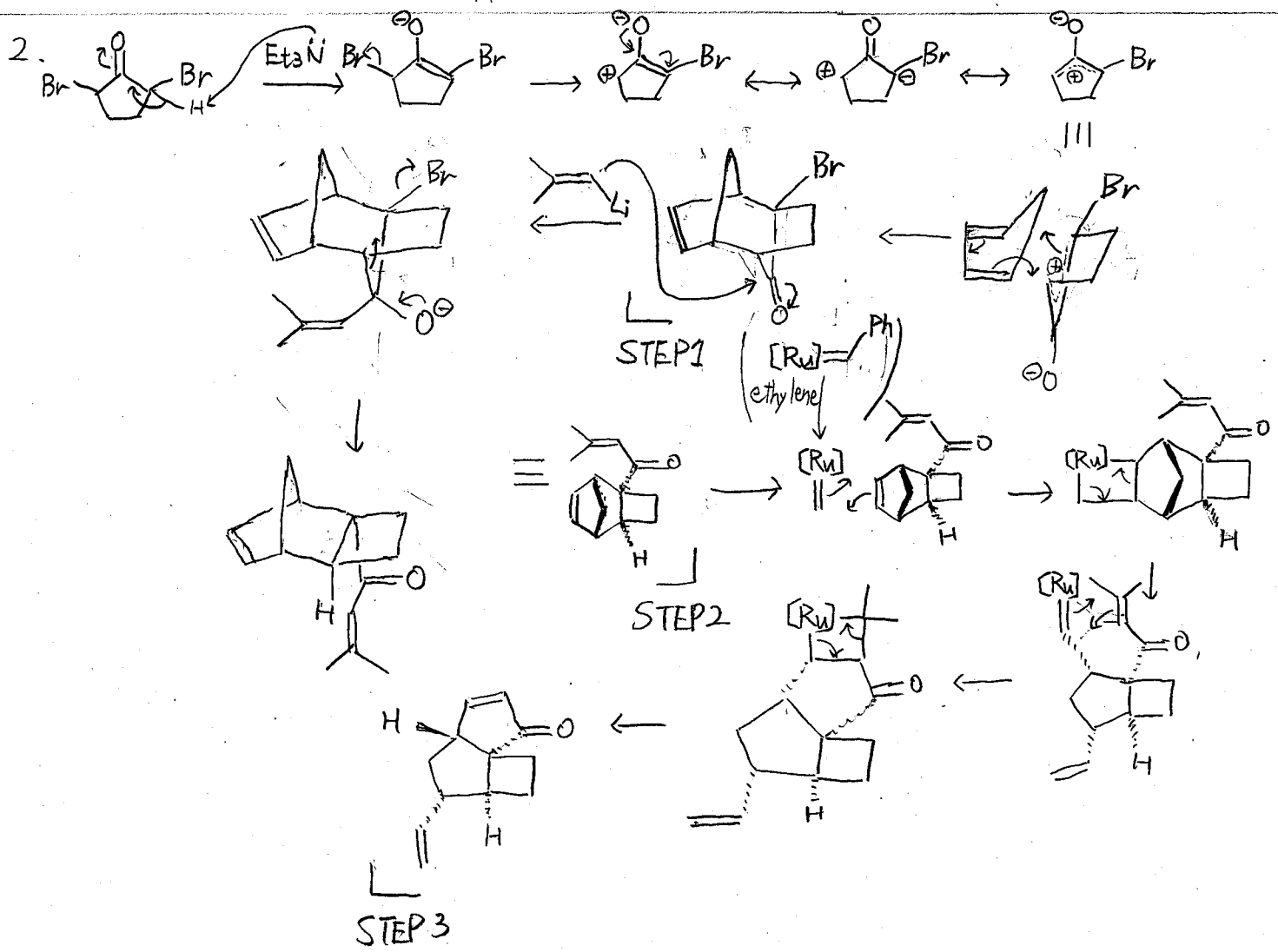

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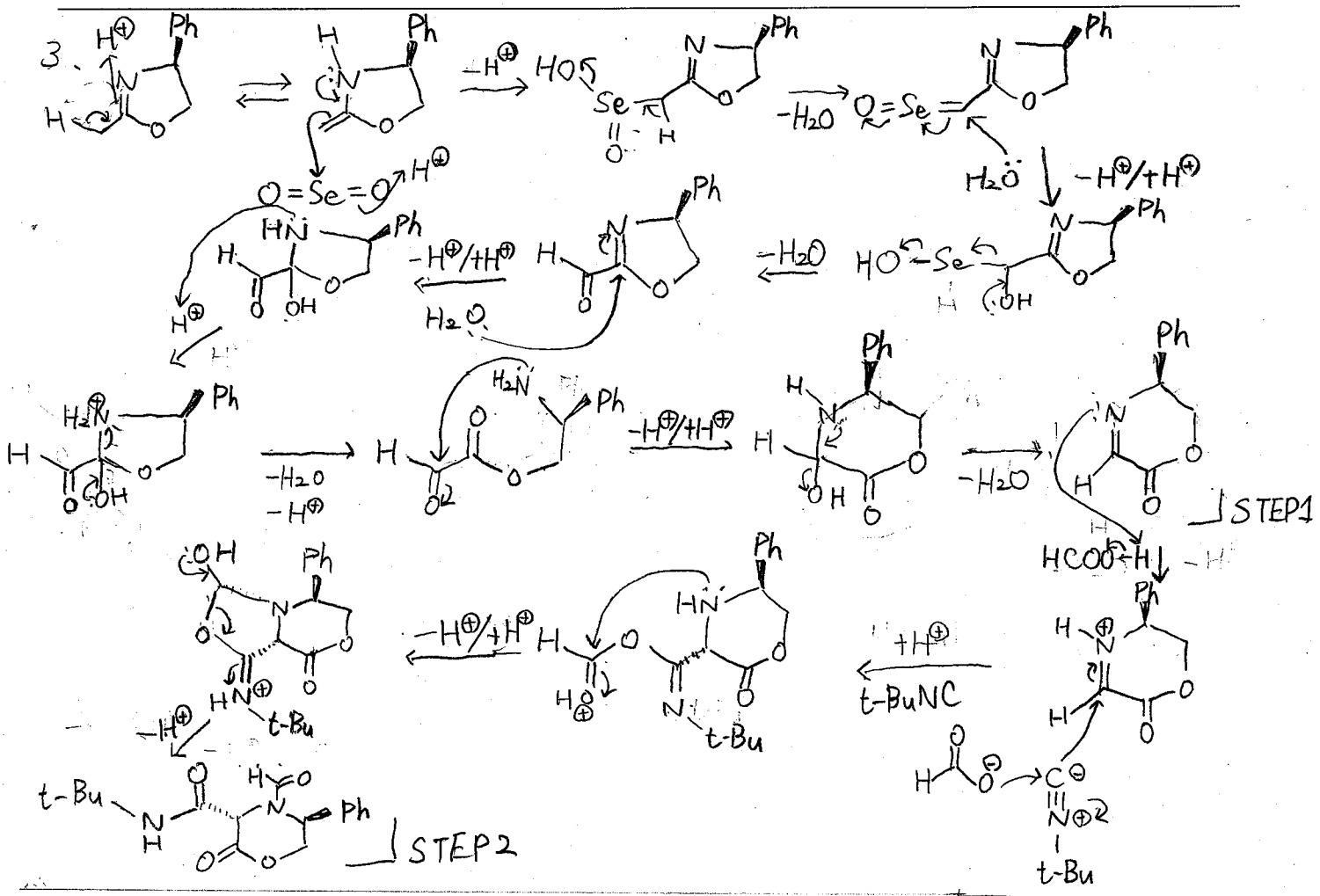

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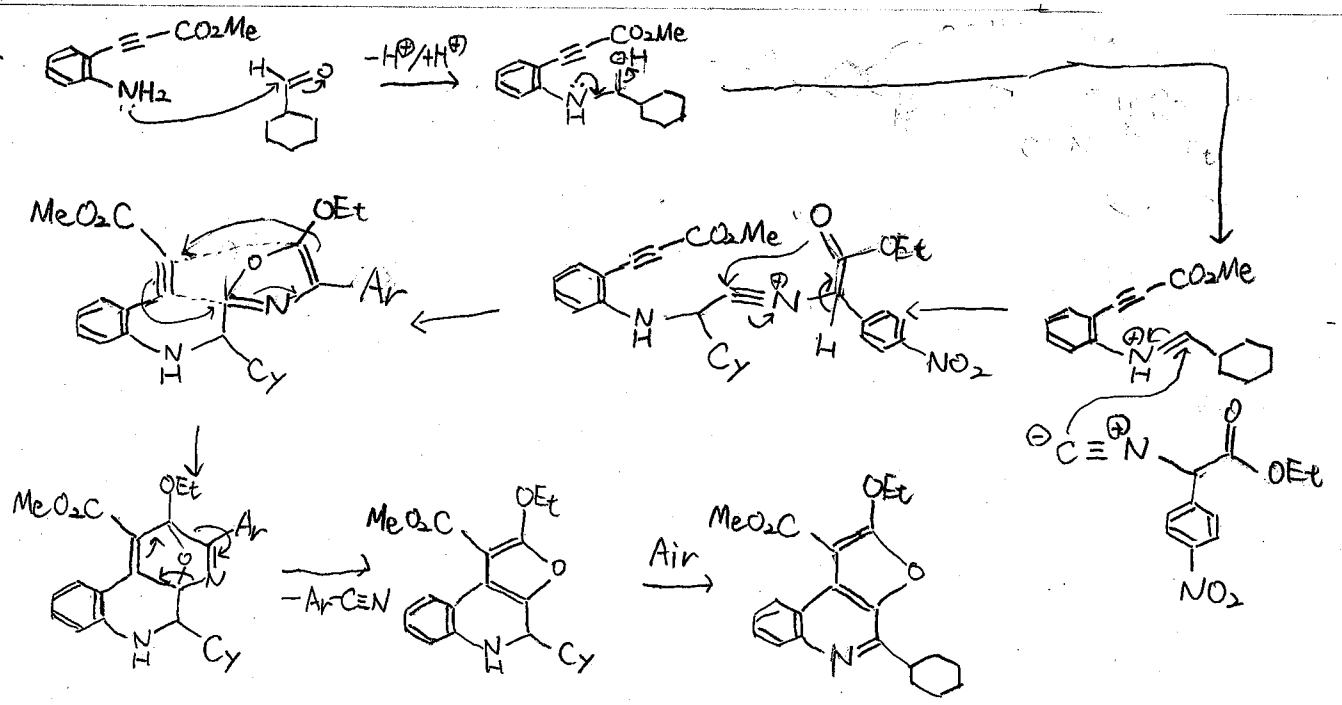
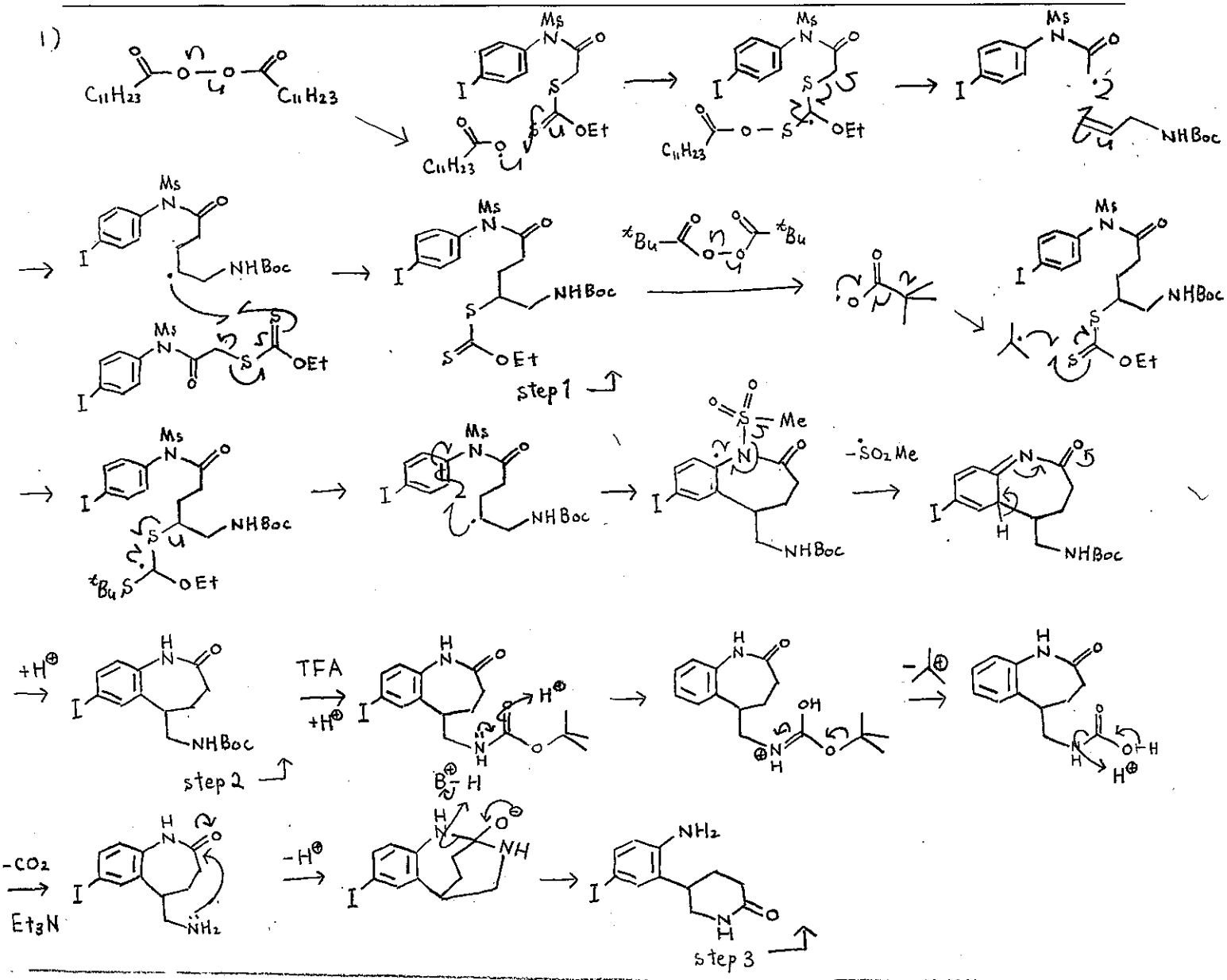
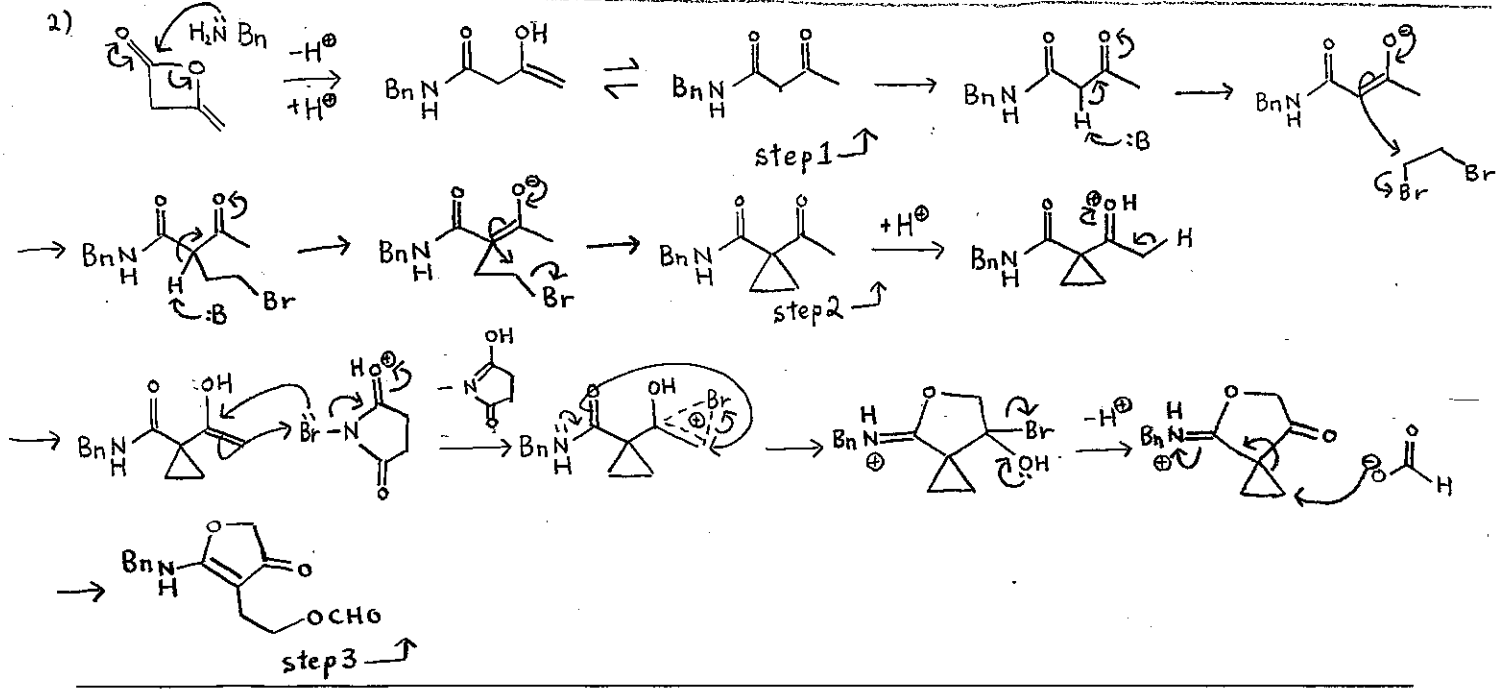


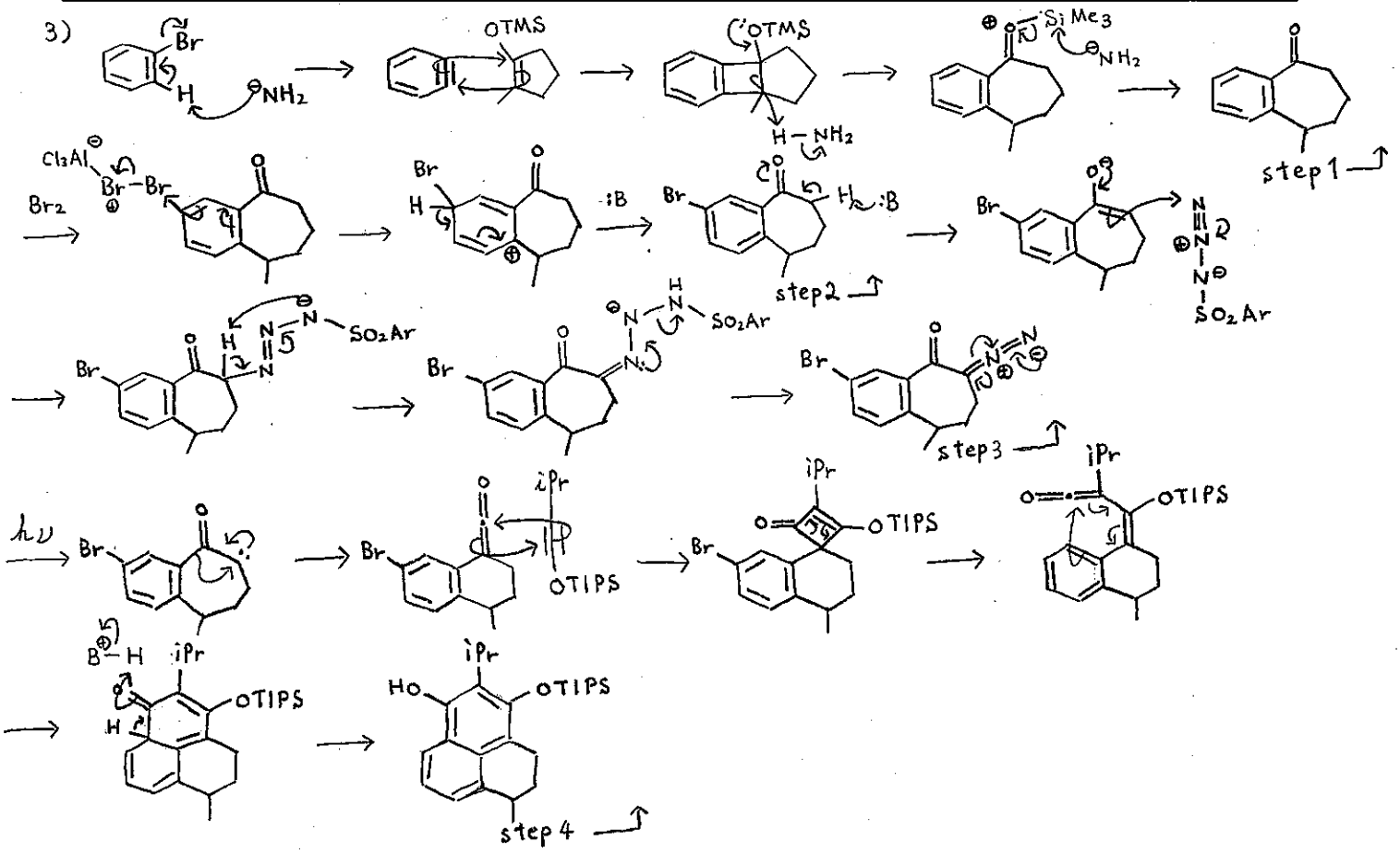
1)


step 1
step 2
step 3
TFA
$+H^{\oplus}$
$-CO_2$
Et_3N
$-H^{\oplus}$
$-SO_2Me$

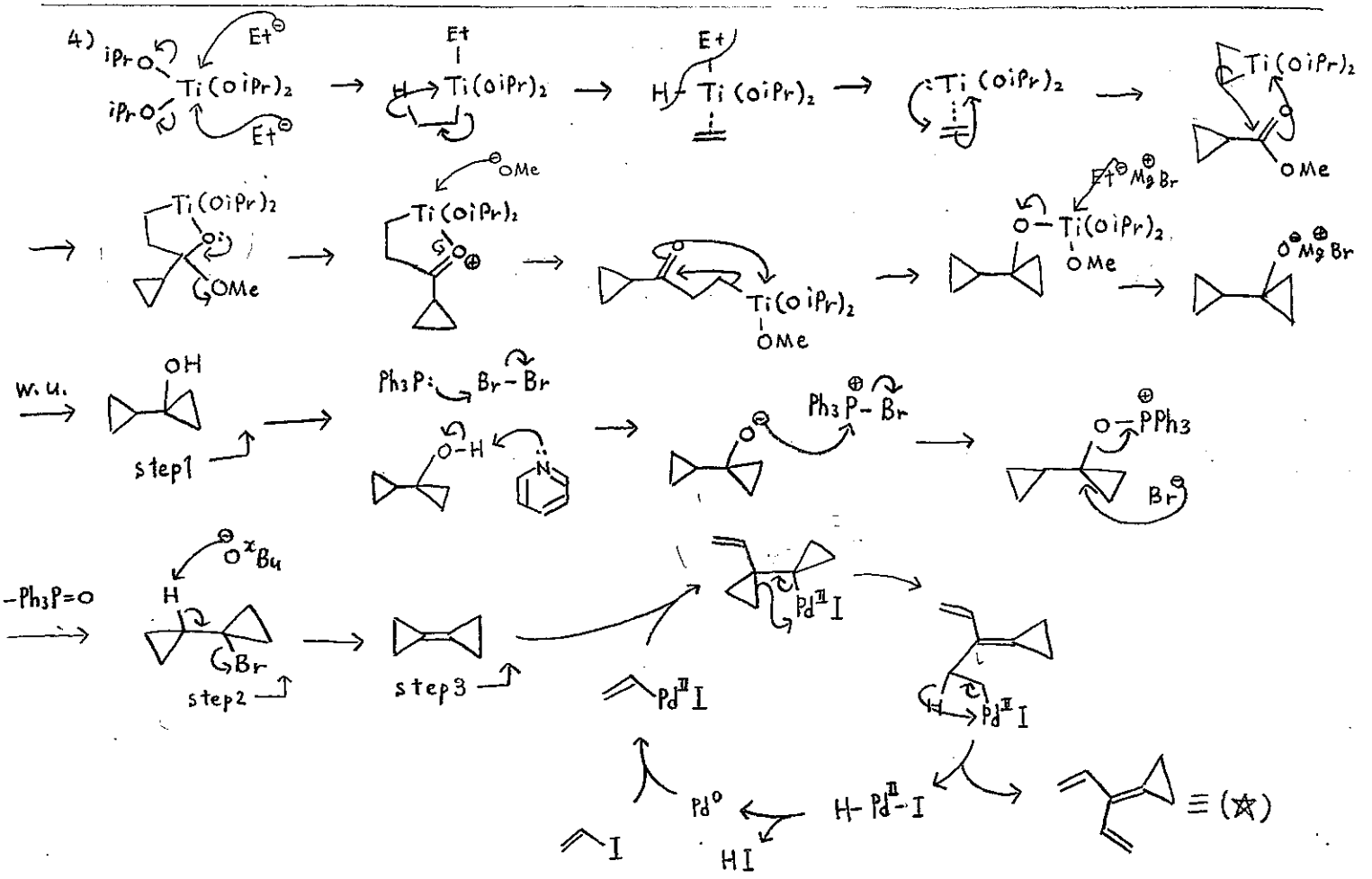
2)

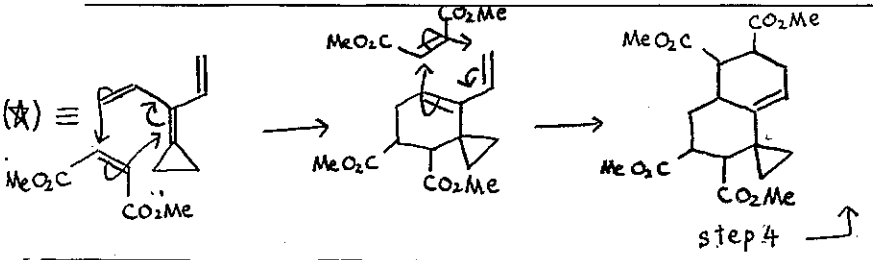

step 1
step 2
step 3
$-H^{\oplus}$
$+H^{\oplus}$

3)

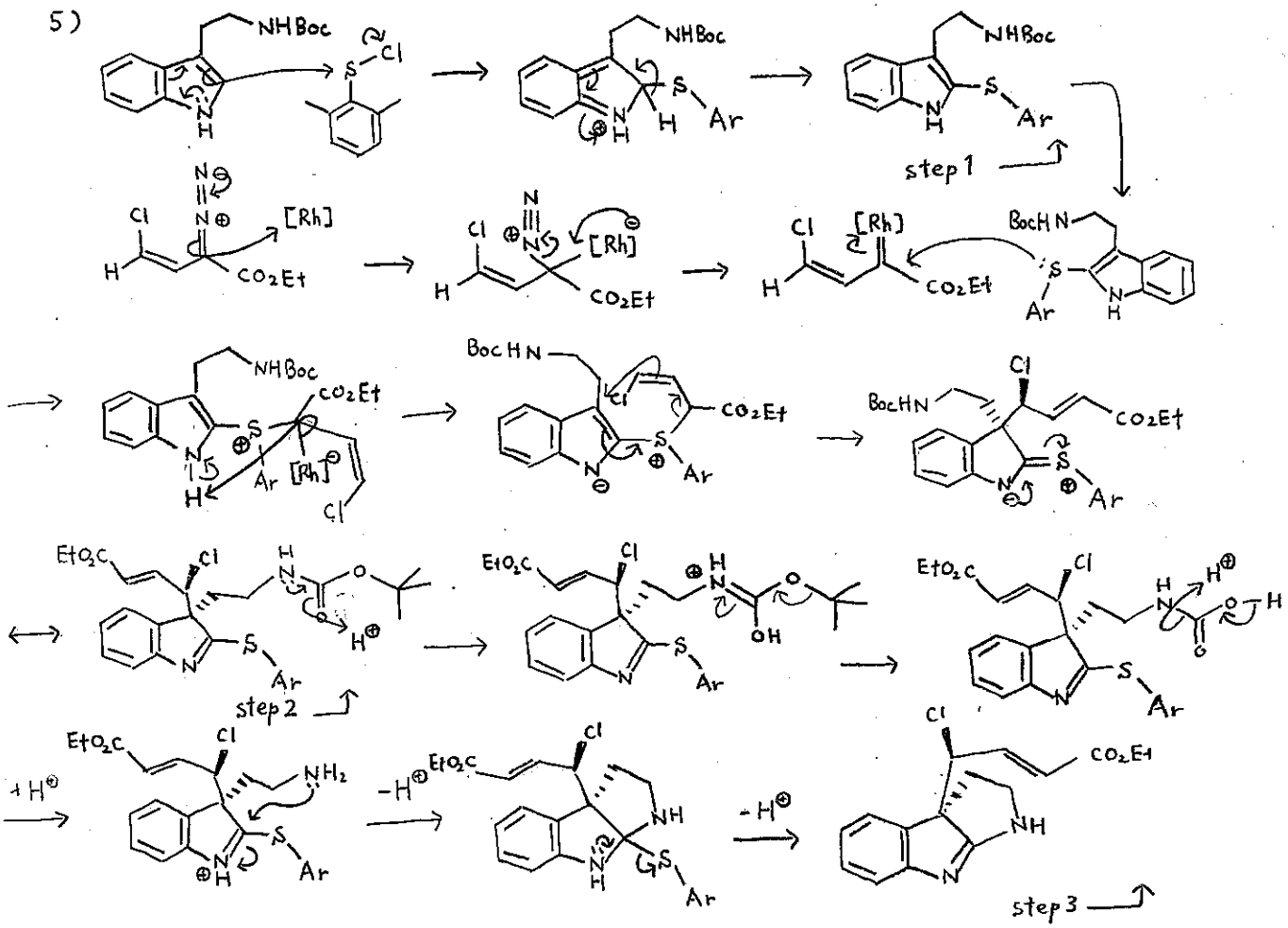


4)




(☆) ≡
MeO2C
CO2Me
step 4

5)


NHBoc
Cl
Ar
step 1
[Rh]
CO2Et
BocHN
step 2
step 3
+H⊕
-H⊕