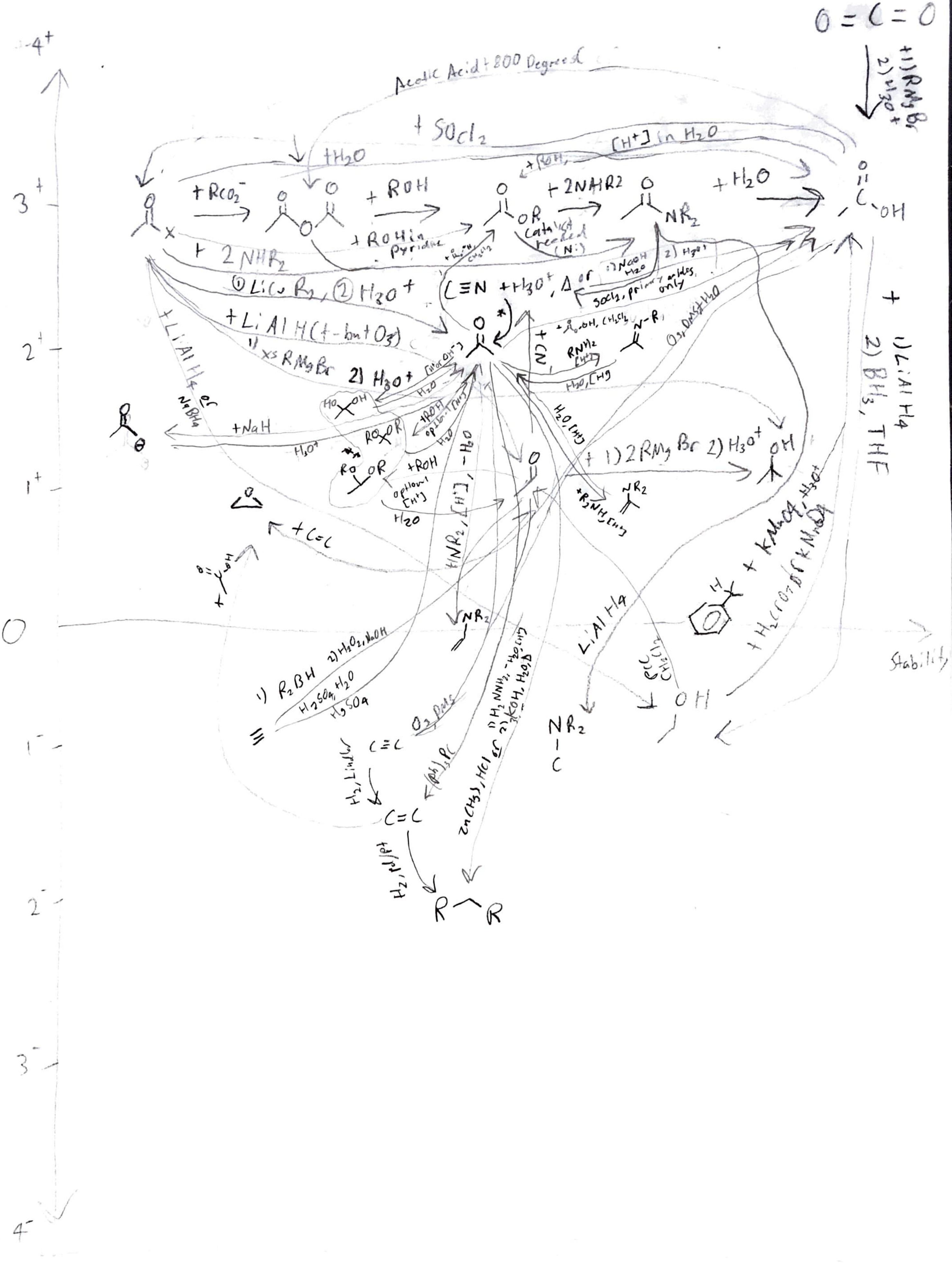
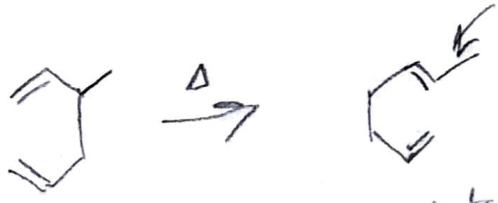

O=C=O
1) RMgBr
2) H_3O^+
Acetic Acid + 800 Degrees C
+ $SOCl_2$
[H^+] in H_2O
+ H_2O
+ RCO_2^-
+ ROH
+ 2NHR2
+ H_2O
+ 2 NHR_2
+ ROH in Pyridine
catalyst needed (N:)
1) NaOH H_2O
2) H_3O^+
① $LiCuR_2$, ② H_3O^+
C≡N + H_3O^+, Δ or
$SOCl_2$, primary amides only
+ LiAlH(t-but O)$_3$
1) xs RMgBr 2) H_3O^+
+ LiAlH$_4$ or NaBH$_4$
+ NaH
H_3O^+
RNH_2
H_2O, [H^+]
+ ROH
optional [H^+]
H_2O
+ C≡C
+ 1) 2RMgBr 2) H_3O^+
+ R_2NH, [H^+]
1) LiAlH4
2) BH_3, THF
+ $KMnO_4$, H_3O^+
+ H_2CrO_7 or $KMnO_4$
LiAlH4
PCC CH_2Cl_2
1) R_2BH 2) H_2O_2, NaOH
H_2SO_4, H_2O
$HgSO_4$
O_3, DMS
H_2, Lindlar
C≡C
C=C
H_2, Pd/Pt
1) H_2NNH_2, [H^+]
2) KOH, H_2O, Δ
Zn(Hg), HCl or
R⌒R
NR$_2$
OH
Stability
4+
3+
2+
1+
0
1-
2-
3-
4-

* $C{\equiv}N$ 1) $RMgBr$ 2) H_3O^+ → 

** For any of these O can be replaced with S

Cope rearrangement:

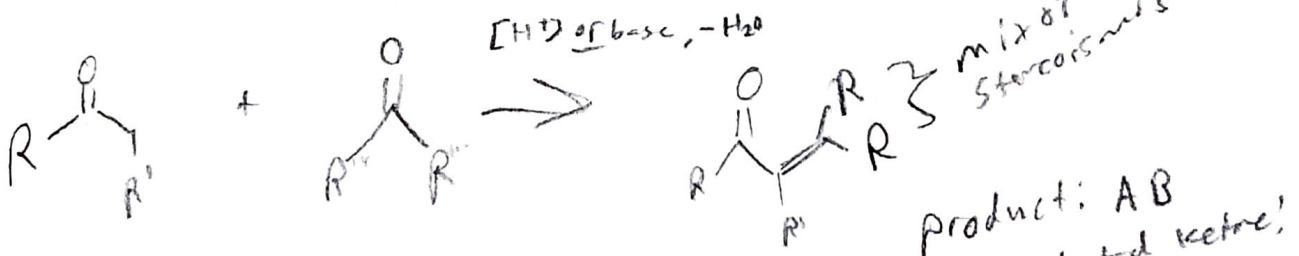


closest points of double bonds must be 2 Cs apart!

Claisen rearrangement:

closest points on double bonds must be 1C & 1O apart. O is bonded to closer -ene.

Aldol condensation:

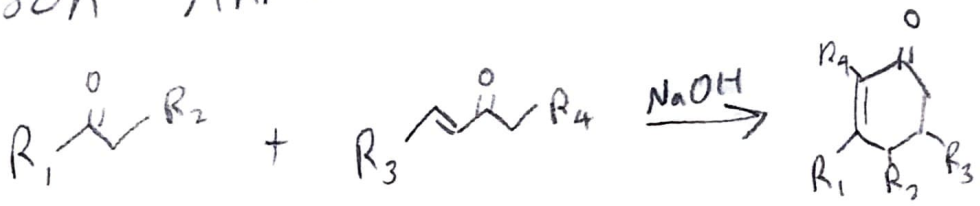


product: AB unsaturated ketone!

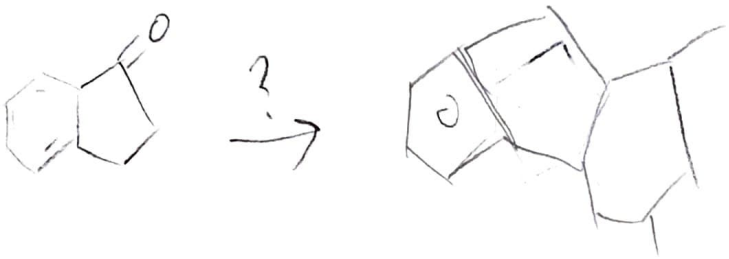
Aldol reaction:

Direct this by deprotonating one before adding the other!

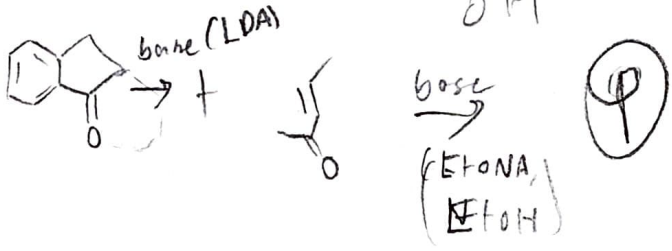
Robinson Annulation:



The O Ketone is where the future double bond will be



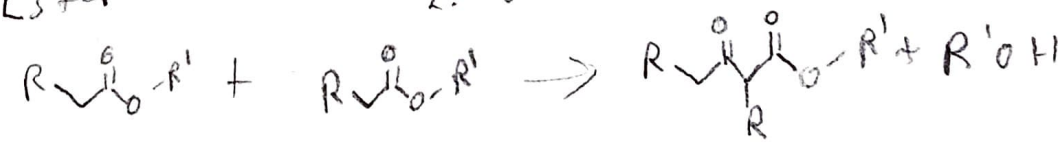
1)



5 or 6 member rings

Claisen Condensation:

Ester + carbonyl $\xrightarrow[2.\ H_3O^+]{1.\ NaOR'}$ beta-Ketoester + alcohol



Dieckmann condensation:

Intra molecular claisen condensation. 1,6 diesters form 5 membered rings and 1,7 diesters form 6 membered rings.

Epoxides

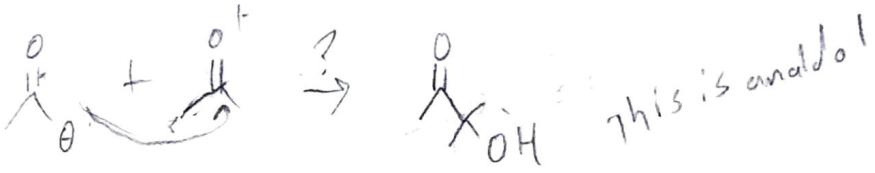
Base catalyzed opening is AM; acid is PM*.

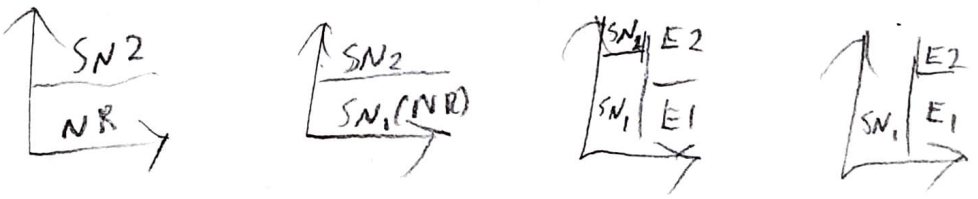
Both come in on opposite sides of the O.

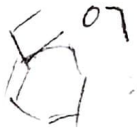
* Describing where the nucleophile goes. Oxygen goes to opposite.

Oxymercuration - demercuration

- PM
- Radical







Syn

Hydrohalogenation
oxidation

Hydration

Hydroboration

hydroxylation w/ OsO_4

Anti

Halogenation

Halohydrin formation

Dihydroxylation

Nucleophillic Aromatic Substitution

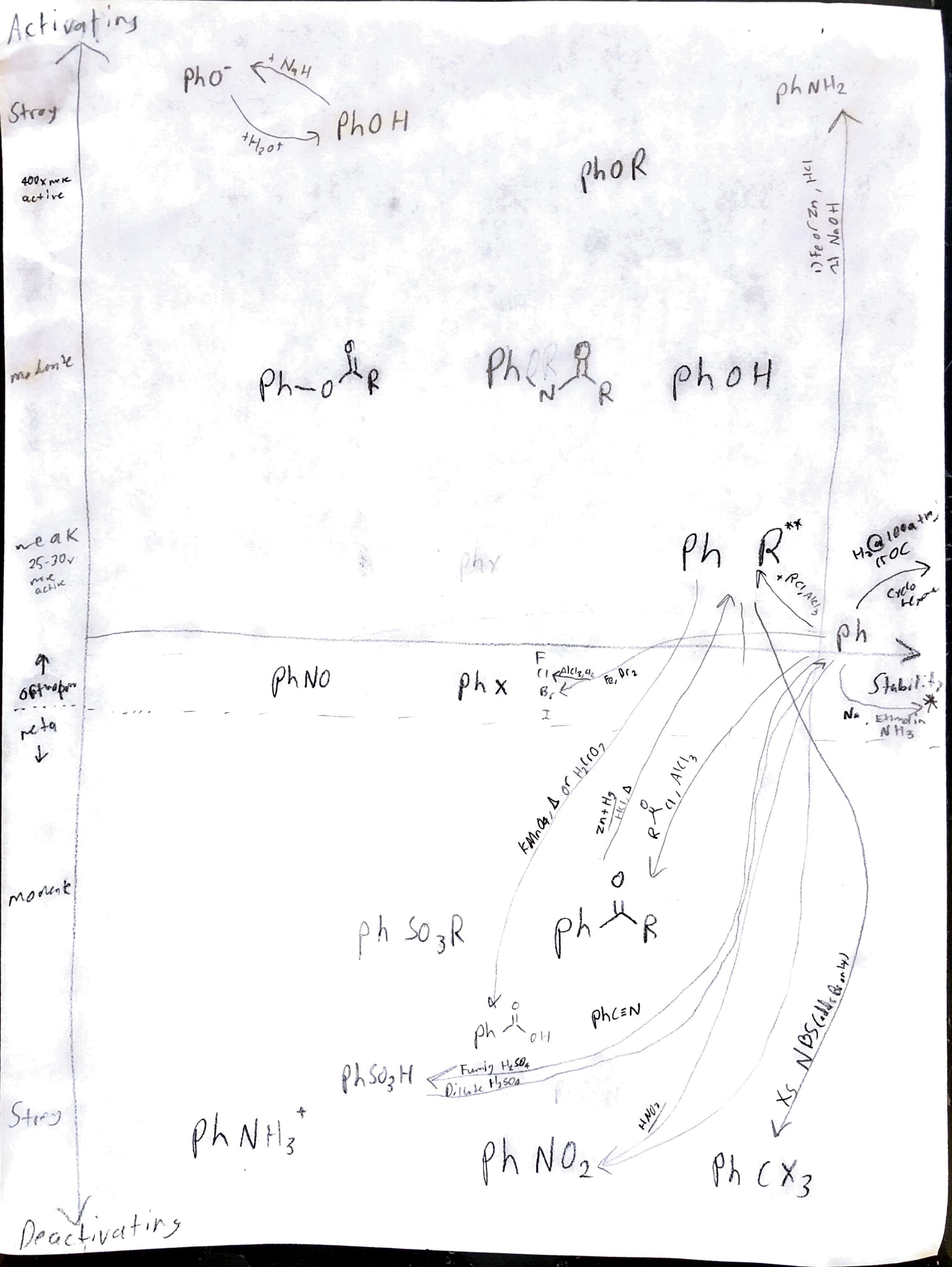
3 criteria:

- Ring must be e⁻ poor
  - e⁻ with draws
- Must be a good leaving group
  - X
  - must be ortho/para to e⁻ withdrawing group

If Not all 3:

Elim - Addition

- Insanely strong base reqrd ($NaNH_2$)
- Meta/para addition observed



Activating
Strong
400x more active
moderate
weak
25-30x more active
ortho/para
meta
moderate
Strong
Deactivating
PhO⁻
+NaH
+H₃O⁺
PhOH
PhNH₂
PhOR
1) Fe or Zn, HCl
2) NaOH
Ph–O–C(=O)R
PhNHC(=O)R
PhOH
Ph R**
+RCl, AlCl₃
H₂ @ 100 atm, 150C
Cyclohexane
Ph
Stability
Na, Ethanol in NH₃
*
PhNO
PhX
F
Cl
Br
I
AlCl₃, Cl₂
Fe, Br₂
KMnO₄, Δ or H₂CrO₇
Zn+Hg
HCl, Δ
RC(=O)Cl, AlCl₃
PhSO₃R
PhC(=O)R
PhCOOH
PhC≡N
PhSO₃H
Fuming H₂SO₄
Dilute H₂SO₄
HNO₃
xs NBS
PhNH₃⁺
PhNO₂
PhCX₃

* If the carbon has an E^- donating group it doesn't get reduced. If it's E^- withdrawing it does. (For Birch Reductions),

** R group needs ≥ 1 Benzylic H