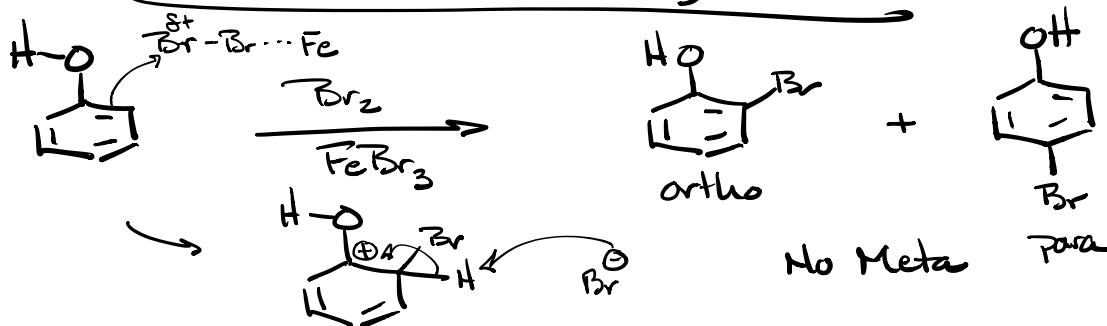
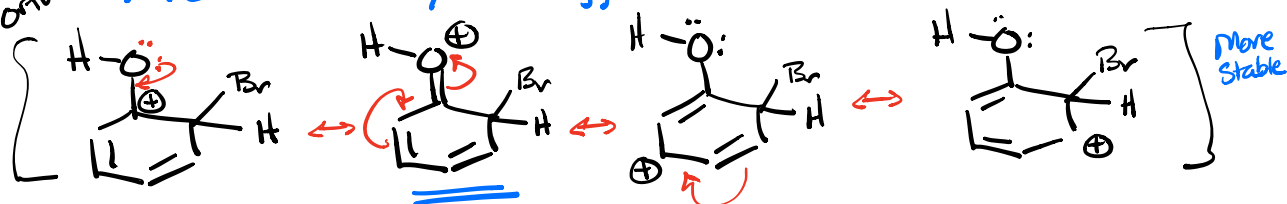


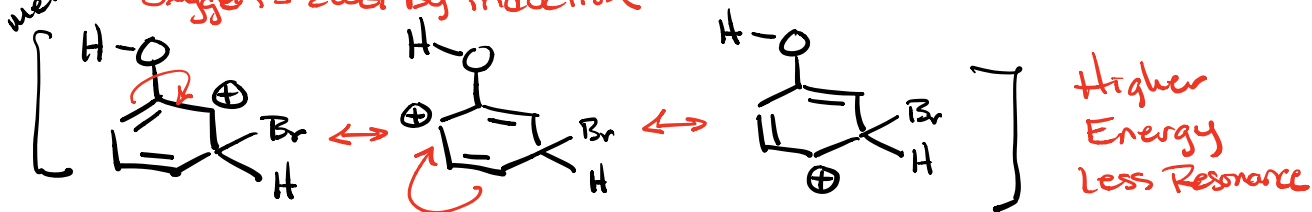
# Ortho/Para directing Groups



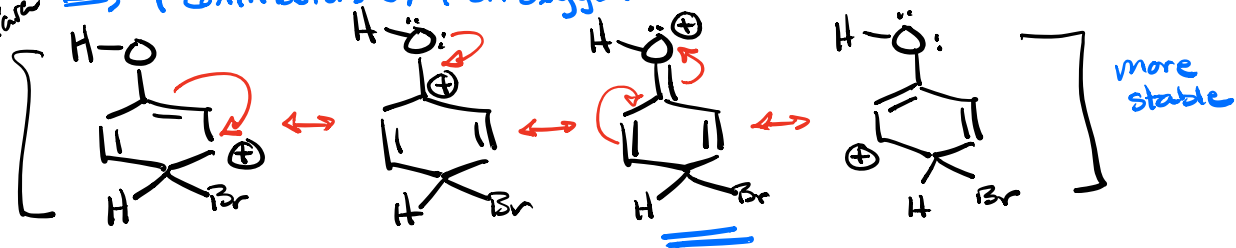
ortho  $\Rightarrow$  4 contributors w/ + on oxygen

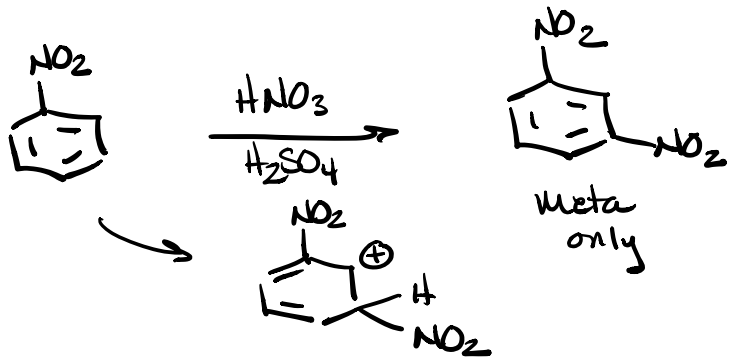


meta Oxygen = EWG by induction

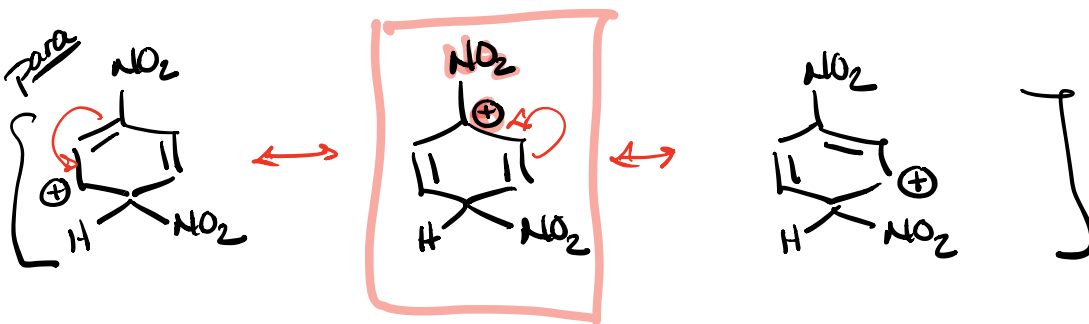
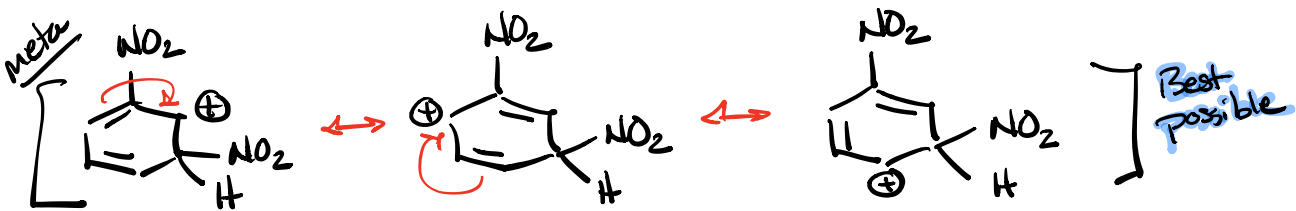
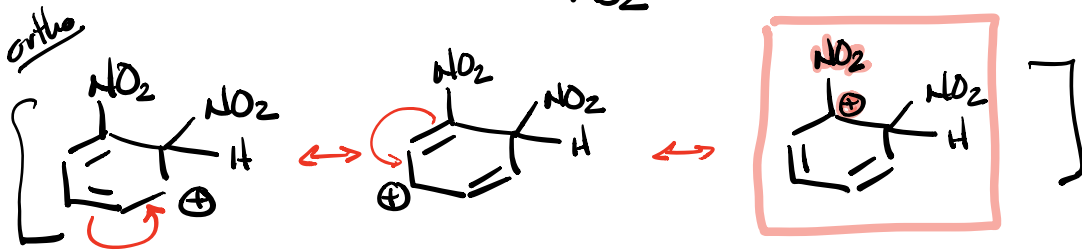


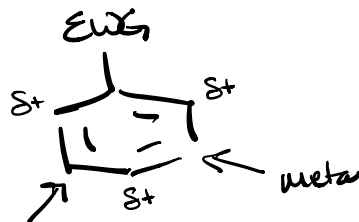
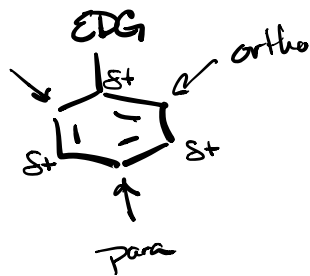
para  $\Rightarrow$  4 contributors w/ + on oxygen





No ortho or para



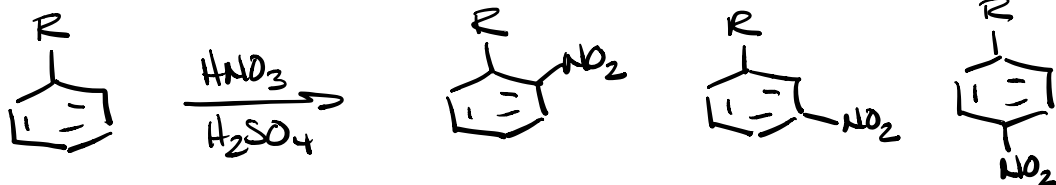


EDG are ortho  
para directors

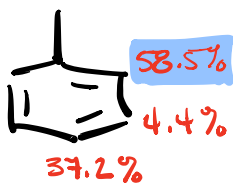
EWG are meta  
directors

EDG are activating  
⇒ Lower EA by  
directly stabilizing  
positive charge

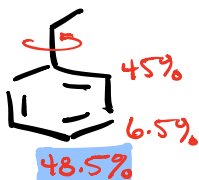
EWG are deactivating  
⇒ Raise EA by  
destabilizing positive  
charge



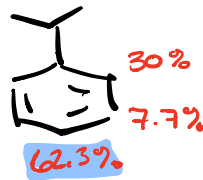
Methyl



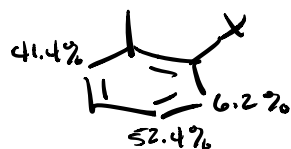
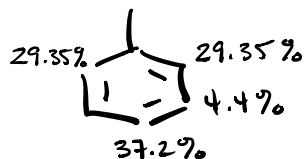
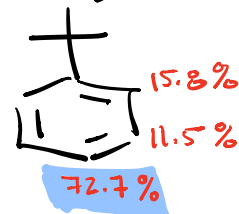
Ethyl



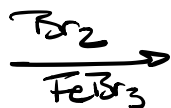
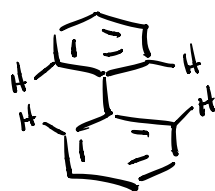
Isopropyl



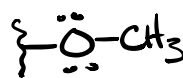
Tert-butyl



29.35	→	41.4%
4.4	→	6.2%
37.2	→	52.4% Major
<hr/>		
70.95		



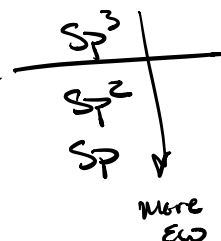
?



EDG by Res  
EWG by Ind



EWG by Induction



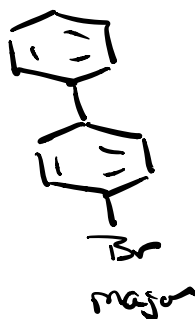
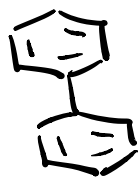
Stronger

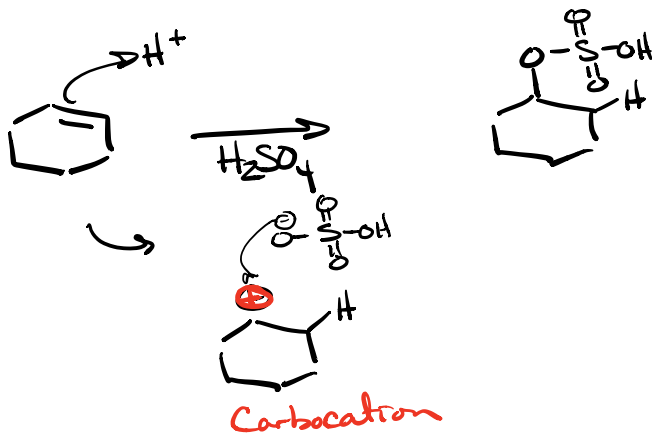
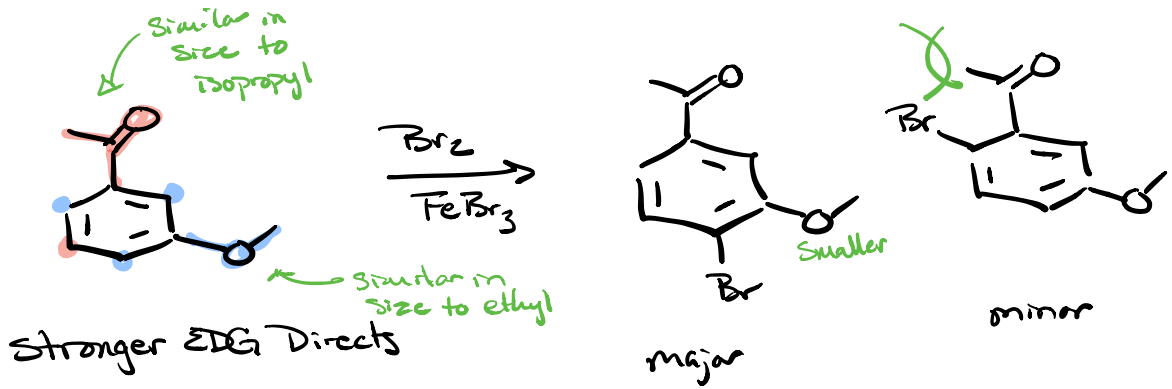
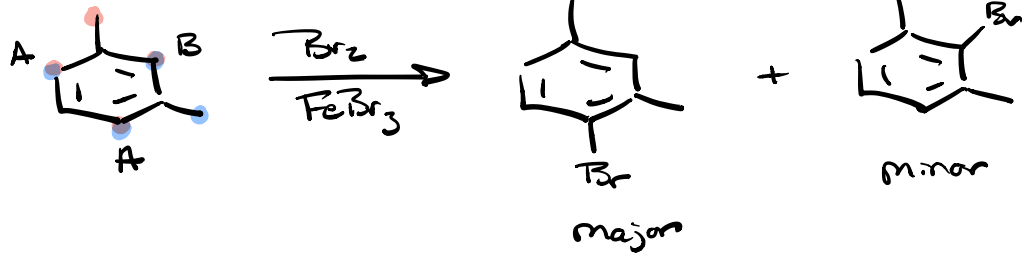


EDG by Resonance

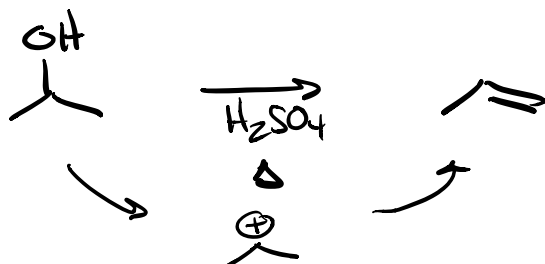
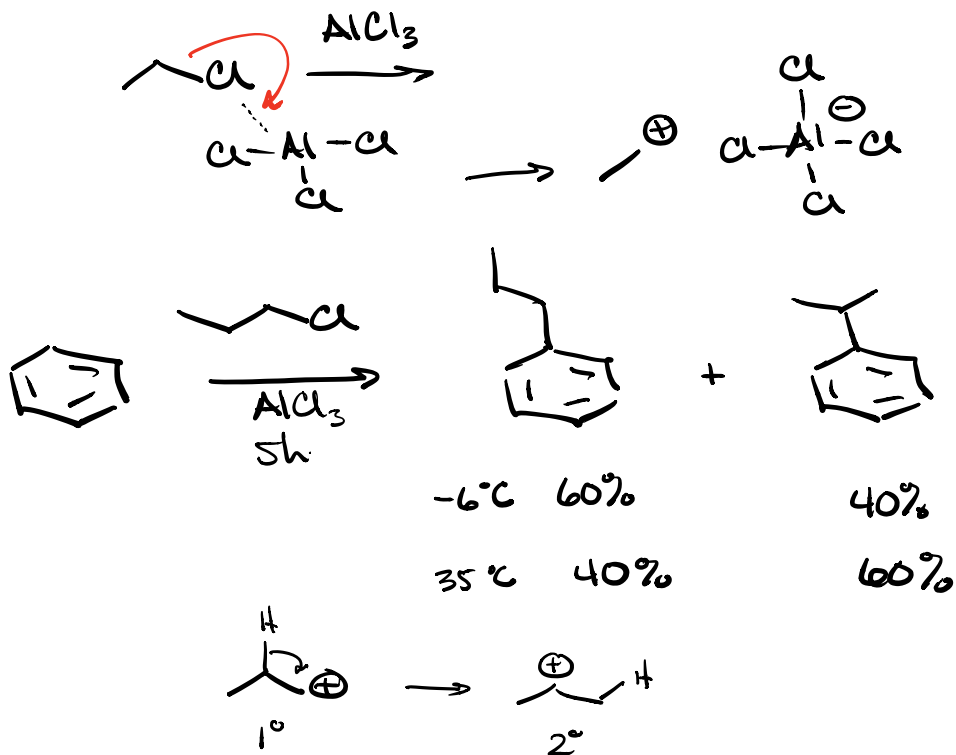
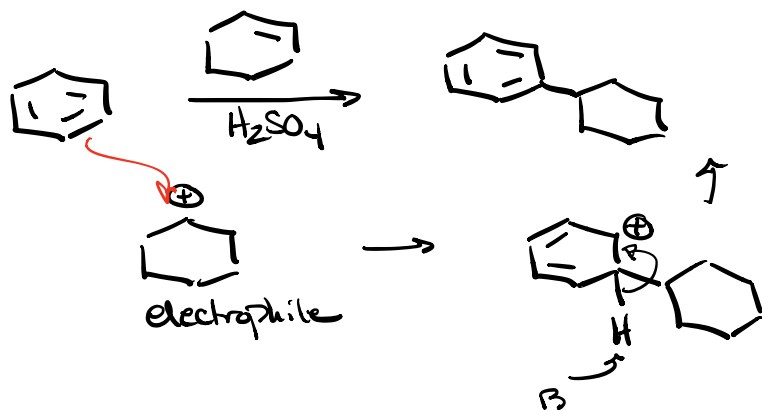


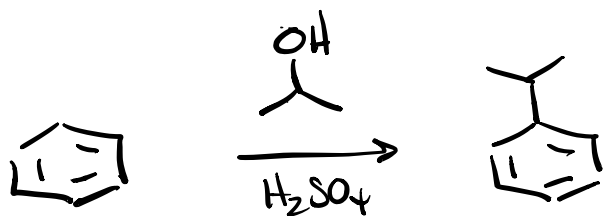
EWG by Resonance



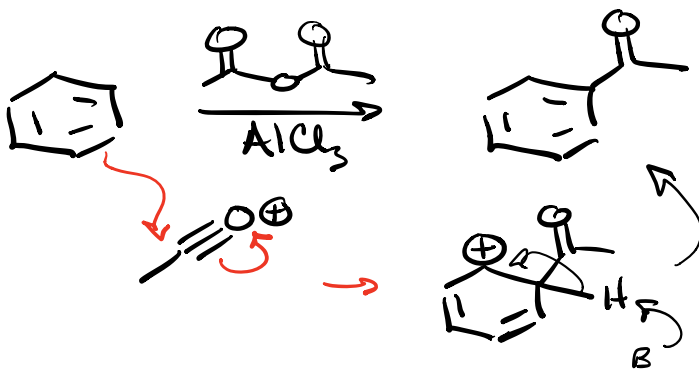
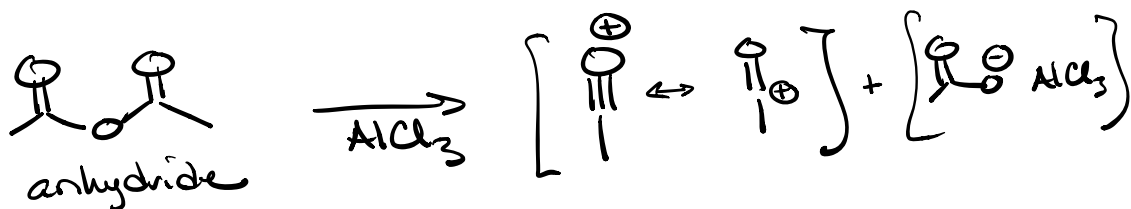


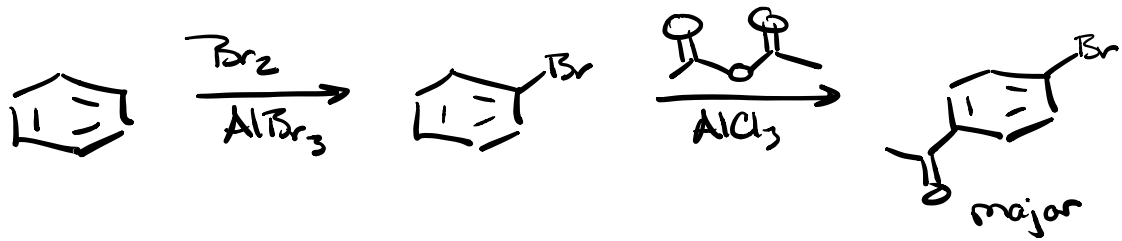
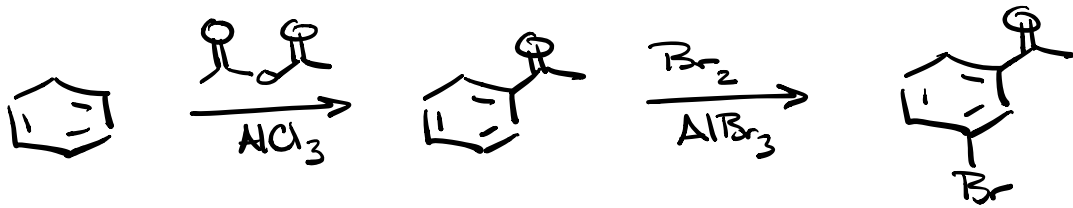
# Friedyl-Crafts Alkylation





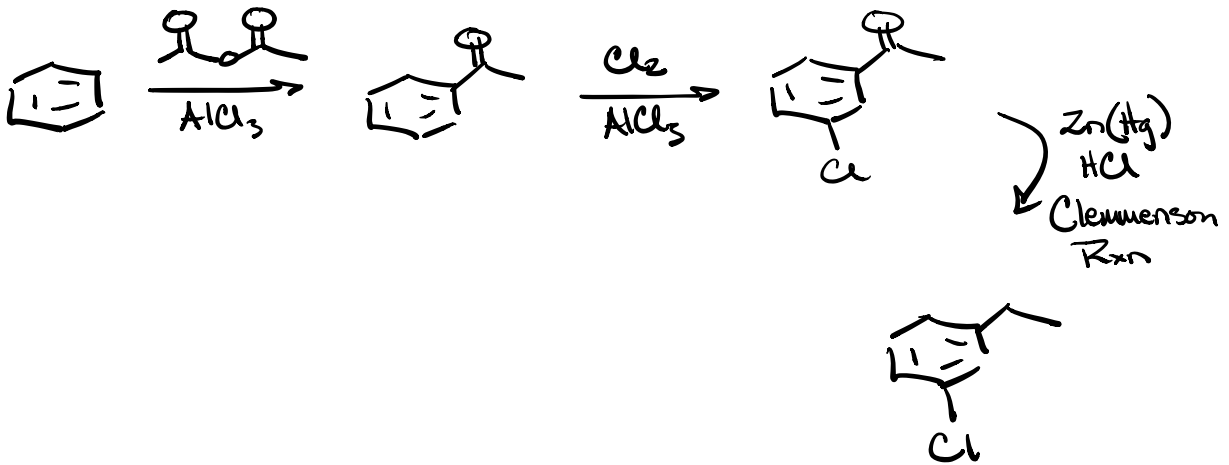
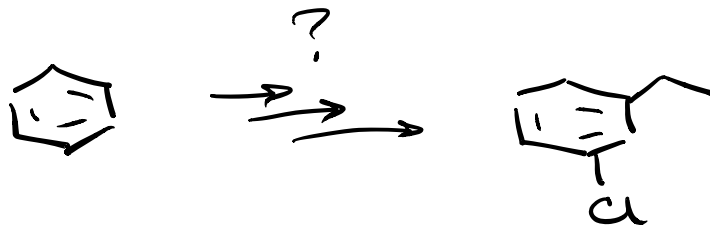
Carbocation = Strong electrophile





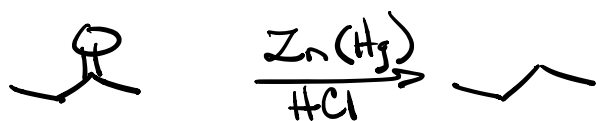
$\text{F} < \text{CH}_3$   
 $\text{Cl} \approx \text{CH}_3$   
 $\text{Br} > \text{CH}_3$

order of addition matters  
for substitution pattern!





## Clemmenson Reduction



## Wolff-Kishner Reduction

