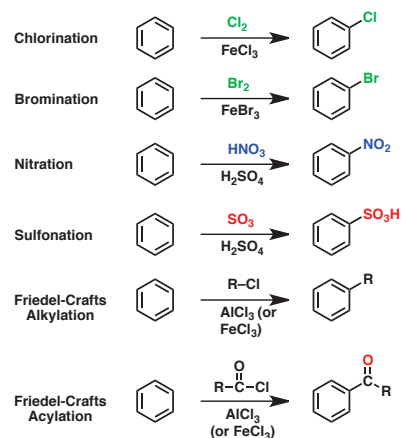


Reactions of Aromatic Compounds

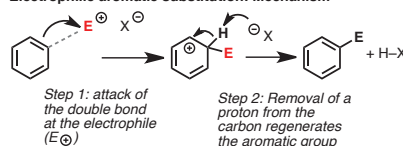
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Note - this sheet is not meant to be comprehensive. Your course may provide additional material, or may not cover some of the reactions shown here. Your course instructor is the final authority.

Six reactions for electrophilic aromatic substitution



Electrophilic aromatic substitution: Mechanism

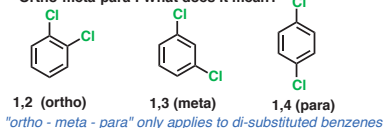


This forms a carbocation.
[Breaks C=C, forms C-E] [Breaks C-H, forms C=C (and X-H)]
rate determining step

Certain substituents will stabilize this carbocation
Stabilize the carbocation, speed up the reaction

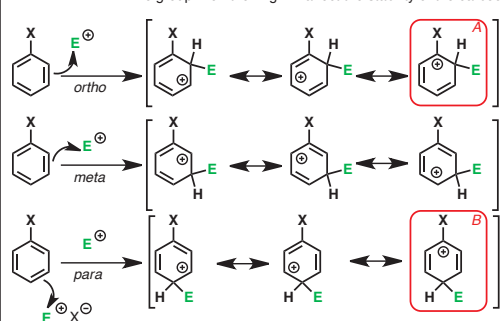
Substituents that stabilize this carbocation (relative to H) are called **activating groups**.

Ortho-meta-para : What does it mean?



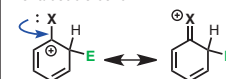
What if there's already a group on the ring?

The group X on the ring will affect the stability of the carbocation



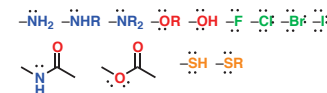
Resonance forms A and B are KEY

If X has an electron pair, these resonance forms will be **stabilized** through formation of a double bond:

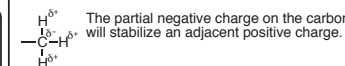


This resonance form is available for the ortho and para adducts, but NOT the meta.

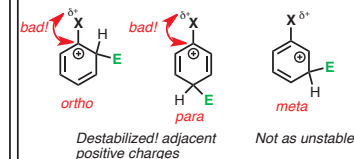
This is why the following groups are ortho-para "directors"



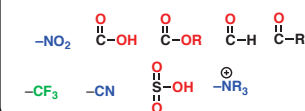
Alkyl groups such as CH_3 , CH_2CH_3 , etc. are also ortho-para directors. Why? Notice the partial charge:



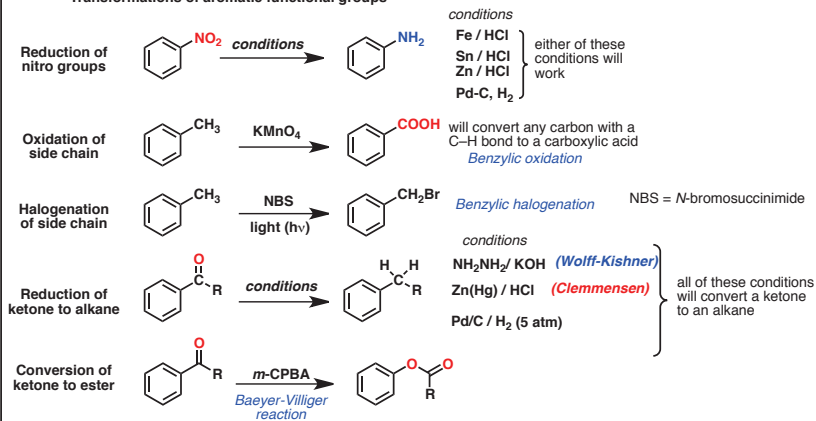
Similarly, if there is a partial positive charge on the atom adjacent to the ring, this will **destabilize** resonance forms A and B



This is why the following groups are meta directors. (Although "ortho-para avoider" is more appropriate)



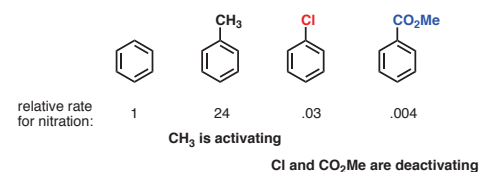
Transformations of aromatic functional groups



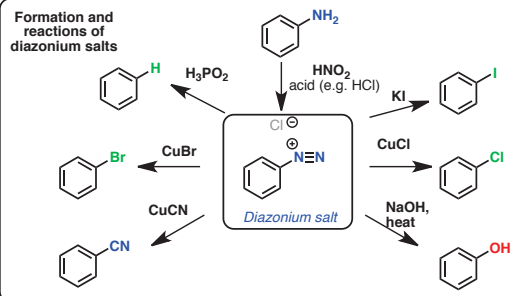
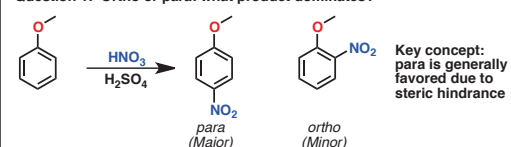
Activating vs. Deactivating : What does it mean?

An **activating group** is a group that causes electrophilic aromatic substitution to be **faster, relative to H**

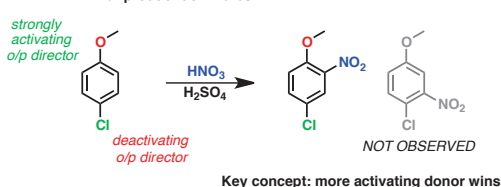
A **deactivating group** is a group that causes electrophilic aromatic substitution to be **slower, relative to H**



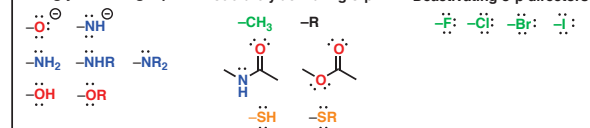
Question 1: Ortho or para: what product dominates?



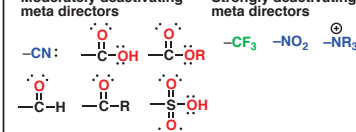
Question 2: When two groups "direct" to different carbons What product dominates?



Strongly activating o-p Moderately activating o-p Deactivating o-p directors



Moderately deactivating meta directors Strongly deactivating meta directors



Omissions, Mistakes, Suggestions?

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