

{youtube}BK09xpyA3vY{/youtube}

Electrophilic Aromatic Substitution: This video provides an overview of both nucleophilic and electrophilic aromatic substitution reactions. First, it provides a list of ortho, para, and meta directors as well as activating and deactivating groups. For electrophilic aromatic substitution reactions - most of the ortho para directing groups are electron donating activating groups and the meta directing groups are electron withdrawing deactivating groups. The reverse is true for nucleophilic aromatic substitution reactions. It lists which groups are strongly, moderately and weakly activating and deactivating so you can be able to rank a list of compounds in order of increasing reactivity toward EAS and NAS. The video also provides a list of named reactions shown below: Benzene Reactions: Nitration -  $\text{HNO}_3$  &  $\text{H}_2\text{SO}_4$  Sulfonation -  $\text{SO}_3$  &  $\text{H}_2\text{SO}_4$  Bromination -  $\text{Br}_2$  +  $\text{FeBr}_3$  Chlorination -  $\text{Cl}_2$  +  $\text{AlCl}_3$  Iodination -  $\text{I}_2$  +  $\text{HNO}_3$  Friedel Crafts Alkylation -  $\text{CH}_3\text{Cl}$ ,  $\text{CH}_3\text{CH}_2\text{Cl}$ ,  $\text{CH}_3\text{CH}_2\text{CH}_2\text{Cl}$ ,  $(\text{CH}_3)_3\text{CCl}$  +  $\text{AlCl}_3$  Friedel Crafts Acylation -  $\text{CH}_3\text{COCl}$  +  $\text{AlCl}_3$  Permanganate Oxidation -  $\text{KMnO}_4$  +  $\text{H}_3\text{O}^+$  Side Chain Halogenation - NBS Gatterman Koch Reaction -  $\text{CO}$ ,  $\text{HCl}$ ,  $\text{AlCl}_3$ ,  $\text{CuCl}$  Grignard Reaction -  $\text{Mg}$ ,  $\text{CO}_2$ ,  $\text{H}_2\text{O}$ , & direct alkylation Sandmeyer Reaction -  $\text{CuCl}$ ,  $\text{CuBr}$ , &  $\text{CuCN}$  Reductive Amination -  $\text{NO}_2$  to  $\text{NH}_2$  using  $\text{NaNO}_2$  &  $\text{HCl}$ , or  $\text{HONO}$ ,  $\text{HNO}_2$  -  $\text{NH}_2$  protecting groups - amine to amide Products formed in this reaction include nitrobenzene, aniline, anisole, benzoic acid, benzaldehyde, styrene, alkyne, benzyl alcohol, benzenesulfonic acid, bromobenzene, iodobenzene, chlorobenzene, toluene, ethylbenzene, propylbenzene, isopropylbenzene, tert butyl benzene, m-nitrobenzoic acid, fluorobenzene, phenol, 1,3,5-tribromobenzene, dibenzene, methylaniline. For the nucleophilic aromatic substitution portion of the video, the addition elimination reaction mechanism and the formation of the Meisenheimer complex was discussed whenever an electron withdrawing group was present. The benzyne intermediate was obtained using  $\text{NaNH}_2$  when no electron withdrawing group is present. In addition, the diazo coupling of two benzene rings was discussed as well. Other reactions include the Friedel Crafts acylation of nitrobenzene, bromination of phenyl benzoate, sulfonation of toluene, nitration of chlorobenzene, reduction of nitrobenzene, fluorination of benzene, Fischer esterification of hydroxybenzoate and acetic acid, and synthesis of aspirin from acetylsalicylic acid using salicylic acid.

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