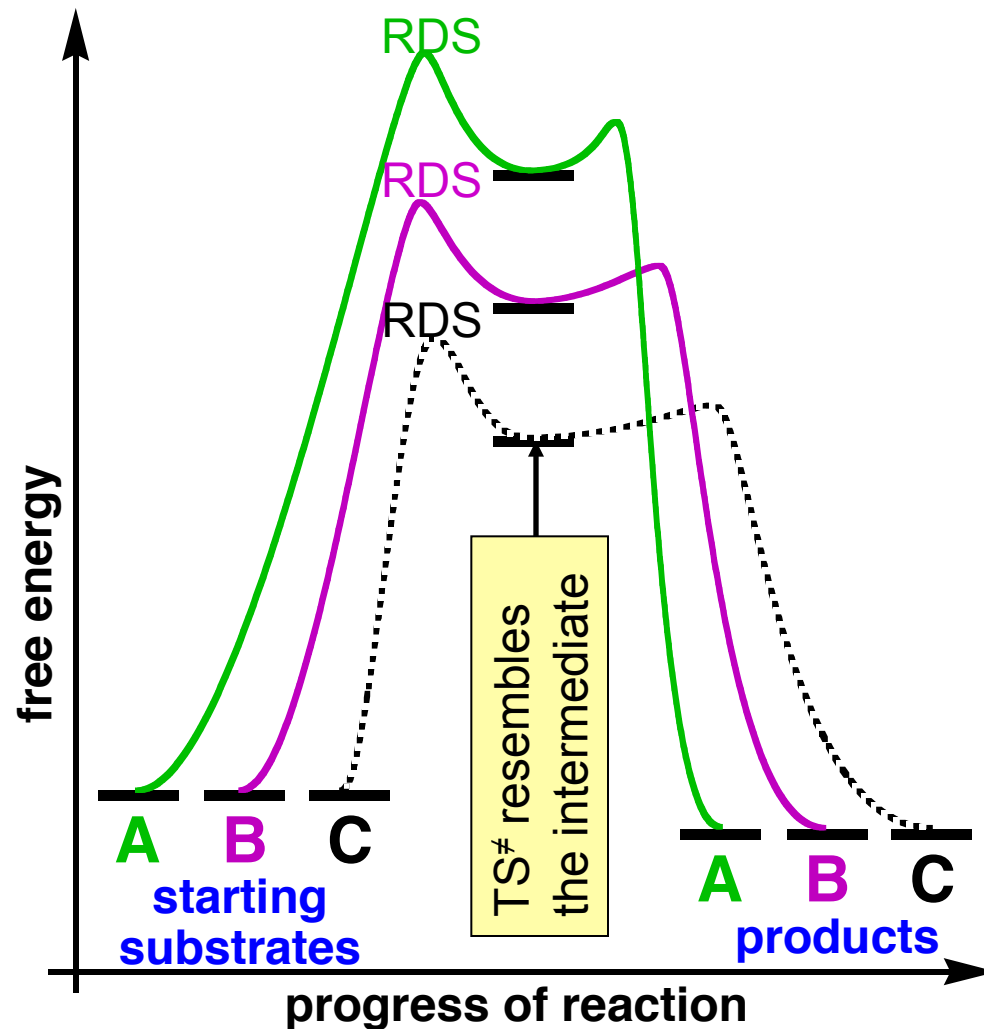
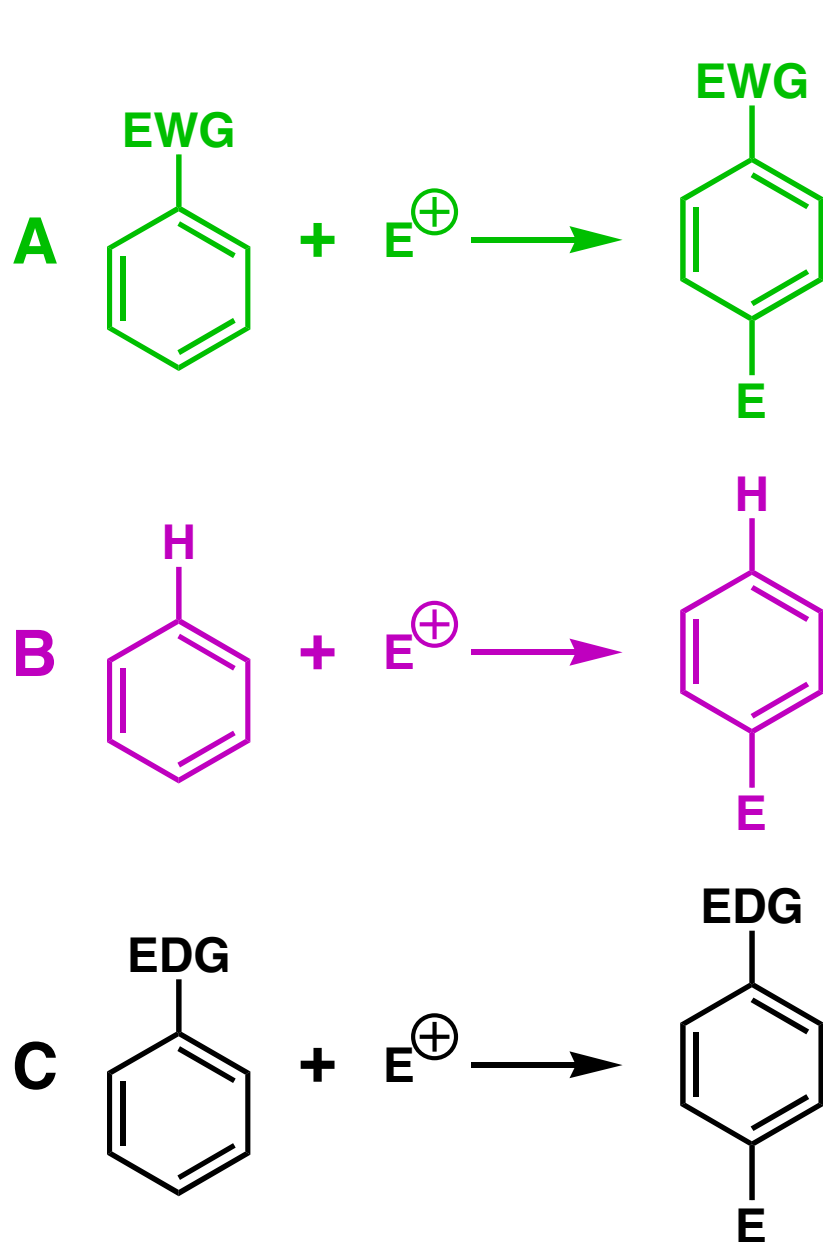


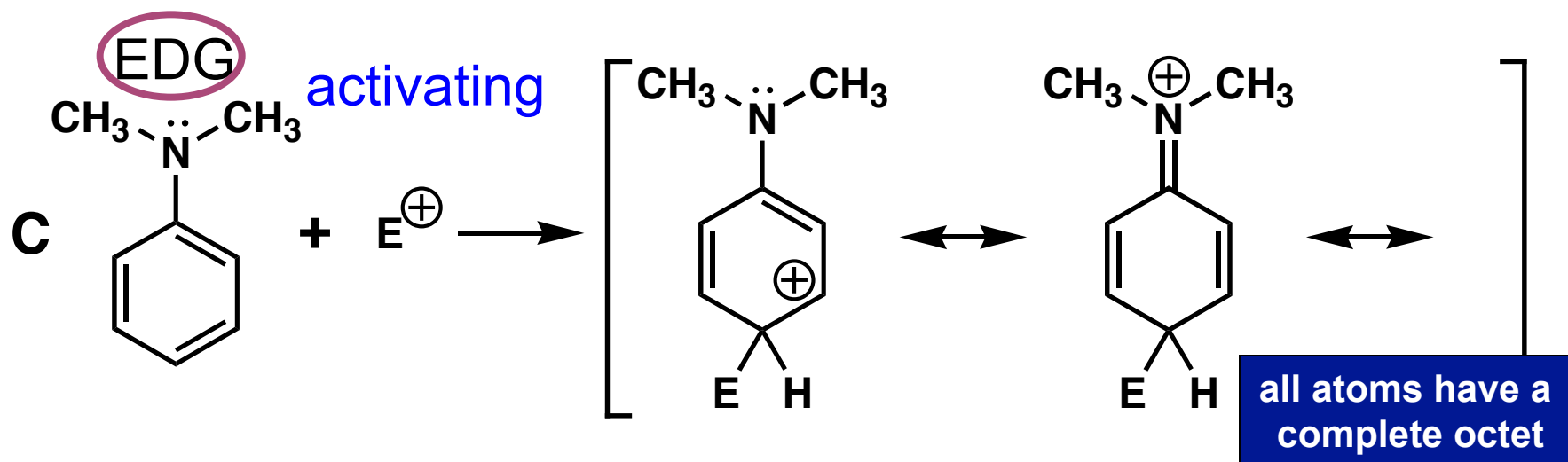
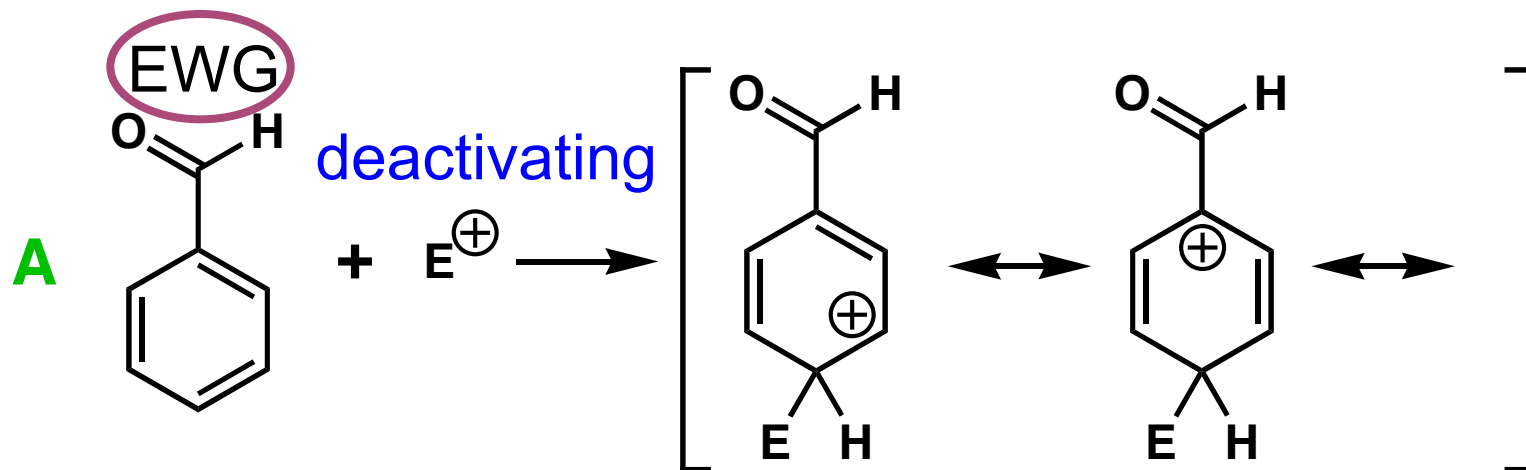
Rationalizing Substituent Effects for Electrophilic Aromatic Substitution Reactions



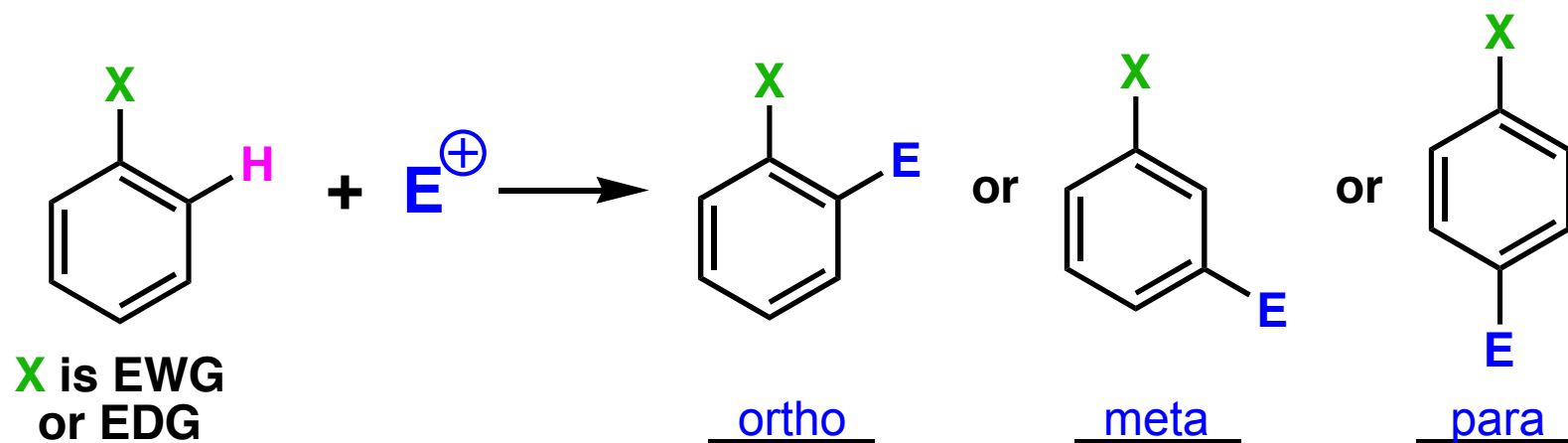
Since the benzene ring is the nucleophile, the reaction is accelerated by EDGs



Comparing Intermediates For Rings with an EWG vs. EDG



Substituents and Regiochemistry in Electrophilic Aromatic Substitution



- All activating substituents (EDG) and weakly deactivating halogens are ortho / para directors
- All substituents more deactivating than the halogens are meta directors (i.e., the EWGs)

Substituent - Reactivity Correlation Chart

Table 16.1 The Effects of Substituents on the Reactivity of a Benzene Ring Toward Electrophilic Substitution

Activating substituents	Most activating		
↓	-NH ₂	Strongly activating	Ortho/para directing
	-NHR		
	-NR ₂		
	-OH		
	-OR		
	$\begin{array}{c} \text{O} \\ \parallel \\ \text{-NHCR} \end{array}$	Moderately activating	
	$\begin{array}{c} \text{O} \\ \parallel \\ \text{-OCR} \end{array}$		
	-R	Weakly activating	
	-Ar		
	-CH=CHR		
	Standard of comparison → -H		

Deactivating substituents					
↓	-F	Weakly deactivating	Ortho / para directing		
	-Cl				
	-Br				
	-I				
	$\begin{array}{c} \text{O} \\ \parallel \\ \text{-CH} \end{array}$	Moderately deactivating		Meta directing	
	$\begin{array}{c} \text{O} \\ \parallel \\ \text{-CR} \end{array}$				
	$\begin{array}{c} \text{O} \\ \parallel \\ \text{-COR} \end{array}$				
	$\begin{array}{c} \text{O} \\ \parallel \\ \text{-COH} \end{array}$				
	$\begin{array}{c} \text{O} \\ \parallel \\ \text{-CCl} \end{array}$				
	-C≡N				
	$\begin{array}{c} + \\ \text{-NH}_3 \\ + \\ \text{-NHR}_2 \end{array}$	Strongly deactivating			
	$\begin{array}{c} + \\ \text{-NH}_2\text{R} \\ + \\ \text{-NR}_3 \end{array}$				
	-NO ₂				
	Most deactivating				

From P. Y. Bruice
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