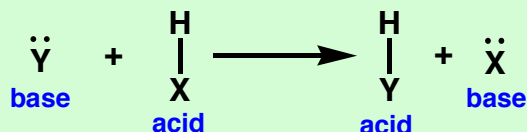


# Substitution at Aromatic Carbon

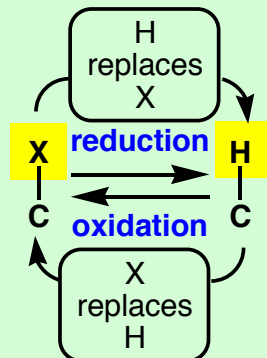
We previously studied **substitution** reactions at  $sp^2$  **carbonyl carbon** and learned that the process goes by variations of nucleophilic acyl substitution. Here we examine substitution at  $sp^2$  **aromatic carbon**. These substitution reactions often follow the **electrophilic aromatic substitution** pathway, although 3 other pathways are possible in certain cases.

## 1) Acid-Base - hydrogen swap

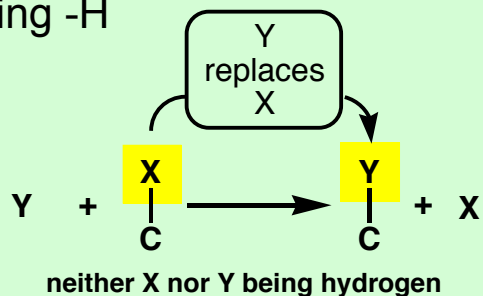


## 2 & 3) Oxidation & Reduction

change in the number of C-H bonds in relation to the number of C-X bonds

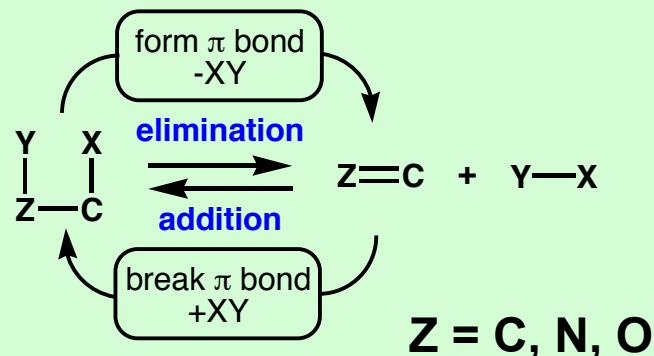


**4) Substitution** - replace C's substituent (-X) with another (-Y), neither being -H

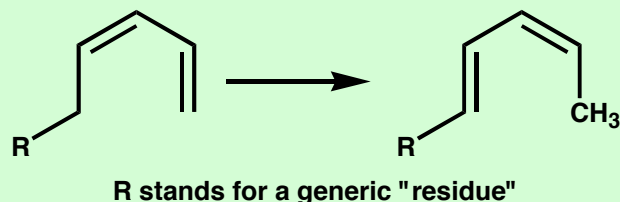


**5) Elimination** - loss of XY elements with concomitant pi bond formation

**6) Addition** - gain of XY elements with concomitant loss of pi bond

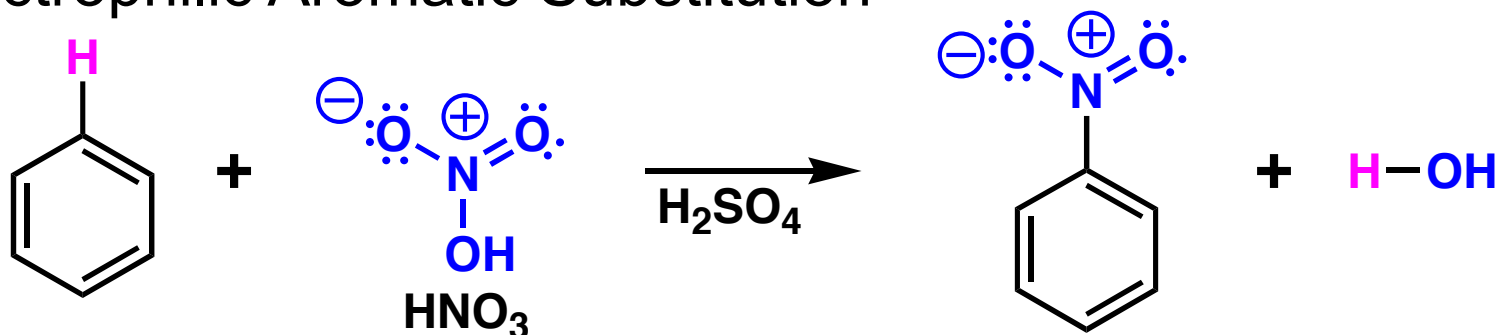


**7) Rearrangement** - isomerization process (no atoms lost or gained); results in new bonding connectivity (one of many examples shown as there is no generic representation).

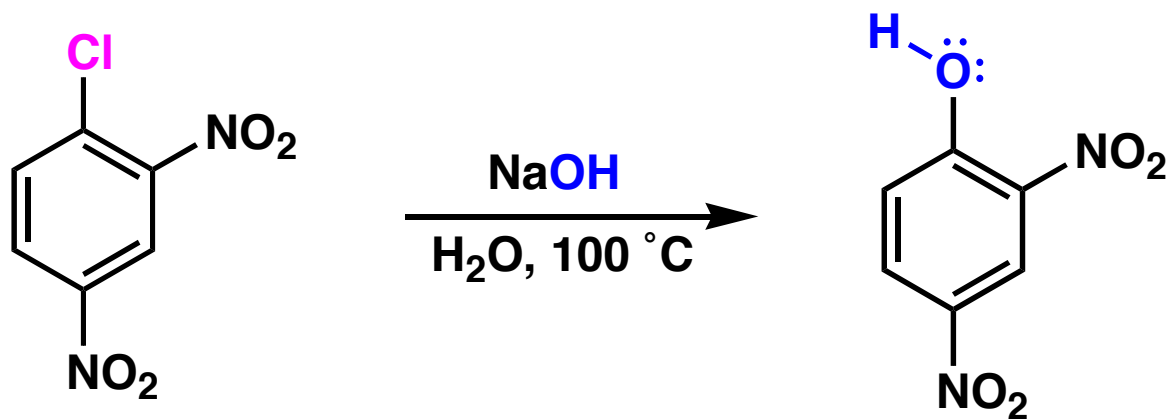


# Aromatic Substitution: Four Examples

## I. Electrophilic Aromatic Substitution

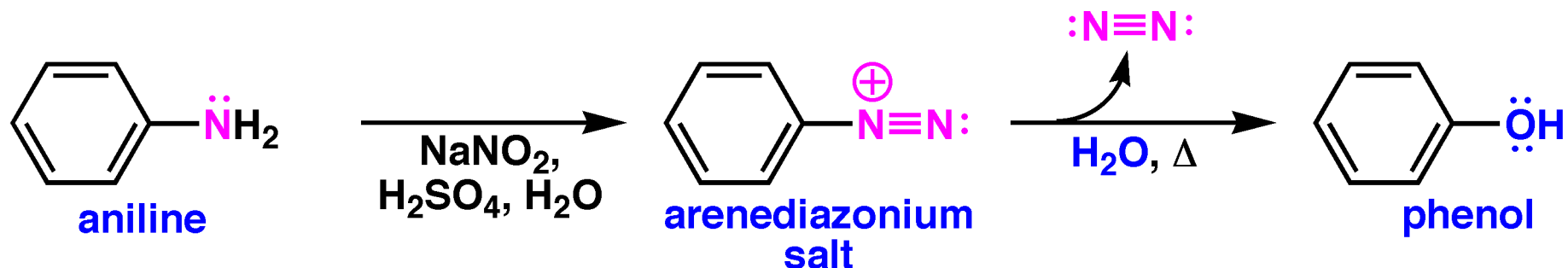


## II. Nucleophilic Aromatic Substitution



# Aromatic Substitution: Four Examples

## III. Substitution via arenediazonium ion



## IV. Substitution via benzyne intermediate

