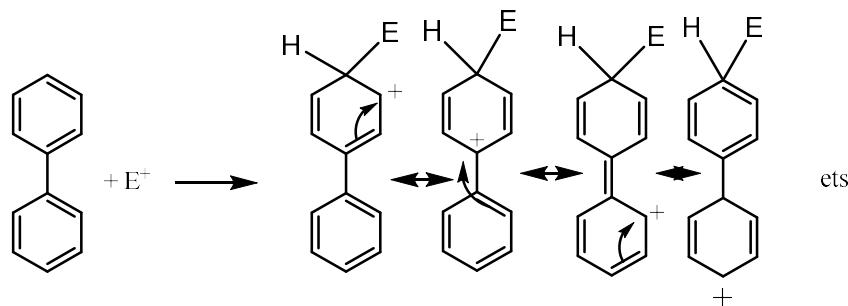
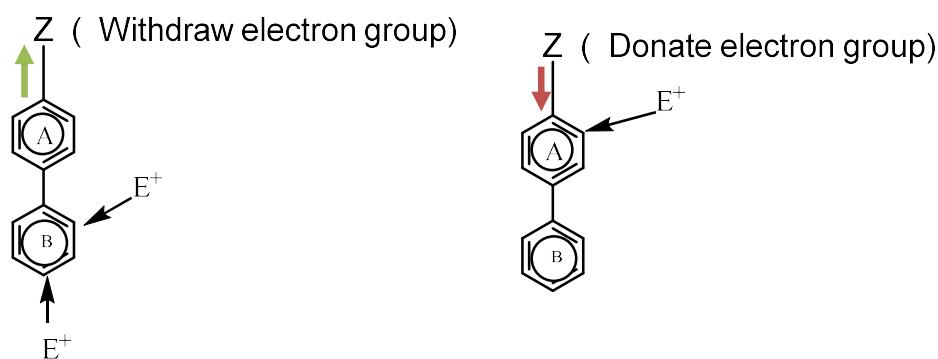
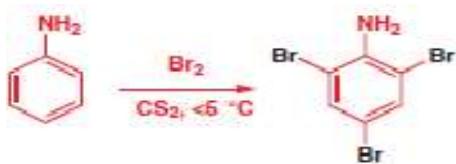
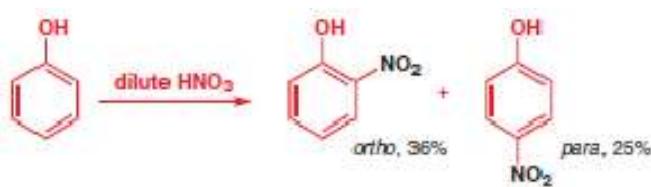
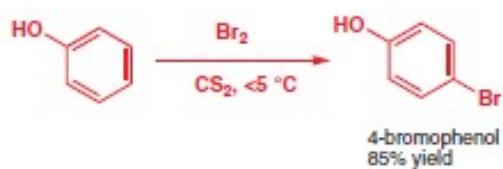
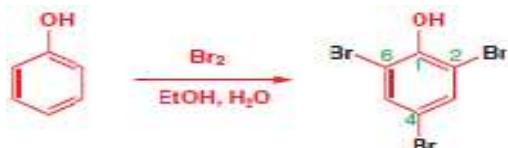
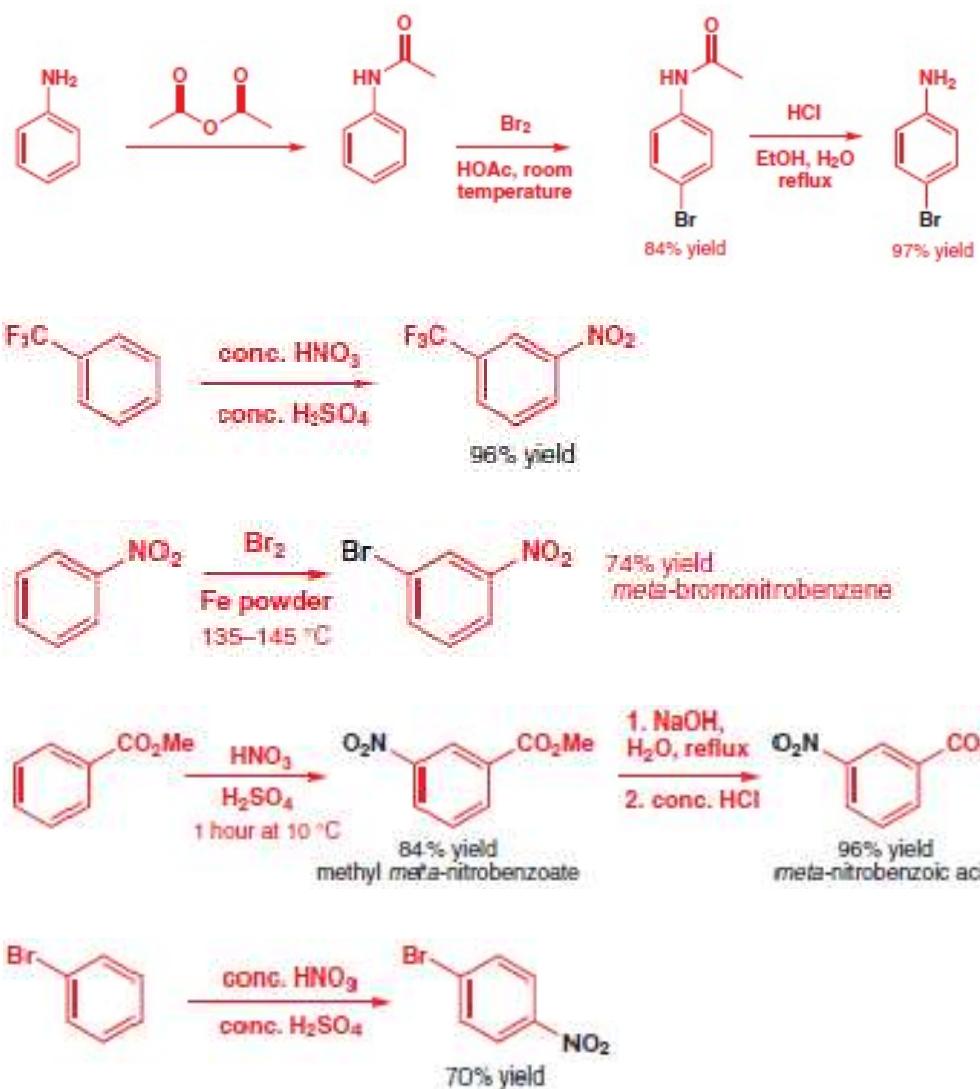


Effect of phenyl substitution on the aromatic ring: (para-substitution)

- Effect of withdrawing and donating group:

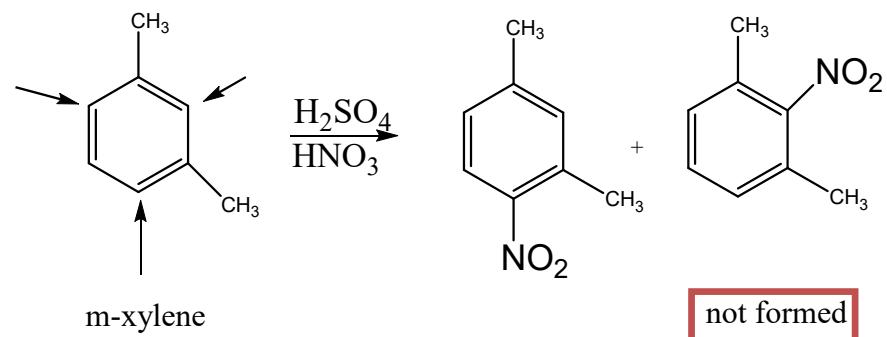
Examples:

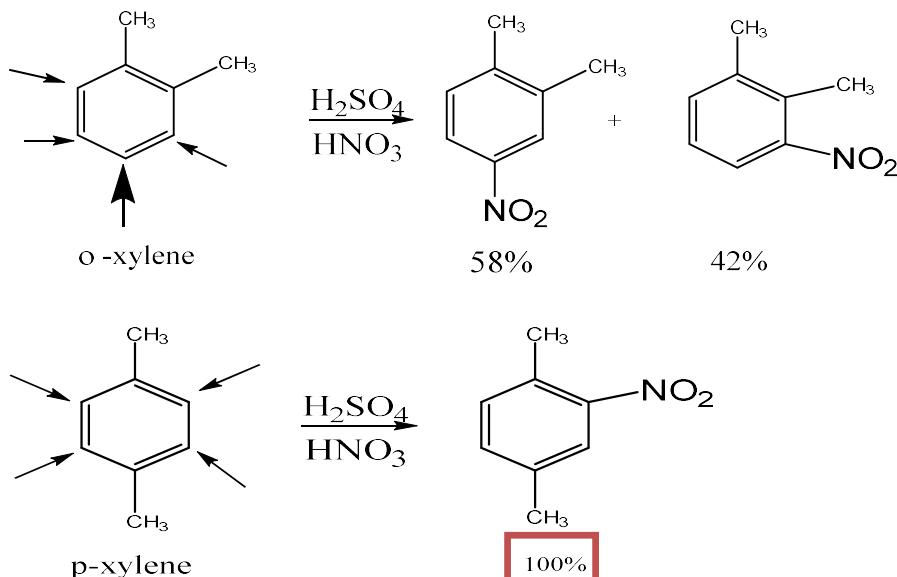


Electrophilic substitution of disubstituted benzene ring:

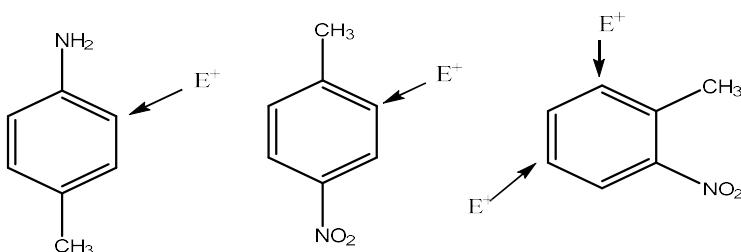
Two or more substituent produces a combine effect on the reactive of an aromatic ring.

a- Di donating groups:



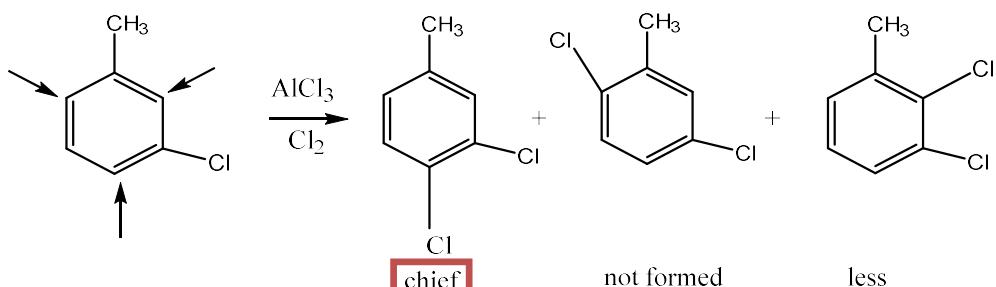


b- Donating and withdrawing groups:



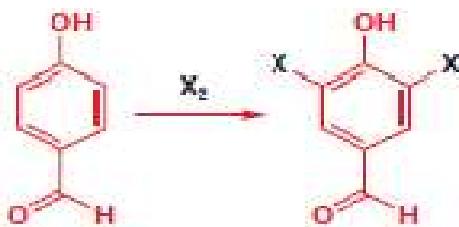
- The presence of groups substituted, one of them **meta** position and the other to be the one donate electrons and the other withdrawing electron shown here **ortho effect** for the group **withdrawing**.

Examples:

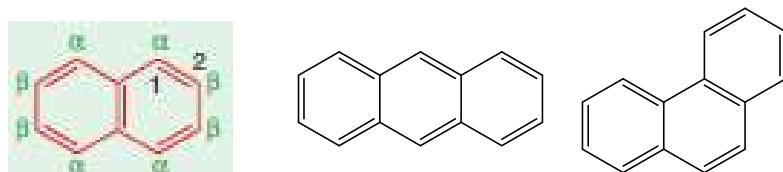


c- Di donating and withdrawing groups:

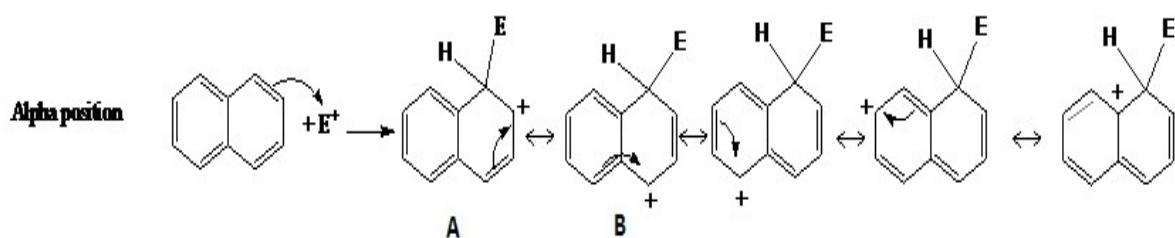


Examples:**Substitution reaction of polynuclear aromatic hydrocarbons:**

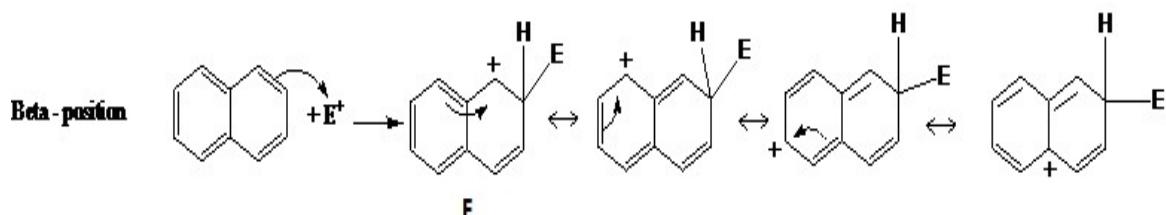
Although **naphthalene**, **phenanthrene** and **anthracene** resemble benzene in many respects, they are **more reactive** than benzene in both **substitution** and **addition reaction**.

**Orientation of naphthalene:**

Orientation in the substitution of naphthalene can be complex, although the **1- position** or **alpha position (α)** is the **more reactive**, substitution usually occurs **more** readily at the **1-position (alpha -position)** than at the **2-position (beta-position (β))** because the intermediate for **alpha-substitution is more stable than that the (beta -position)**. The reason in that the most favorable resonance structure for either intermediate is those that have one fully aromatic ring.

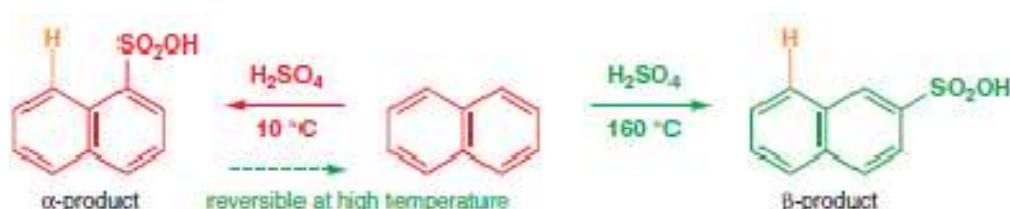


5 resonance structures. Two structures (A, B) have full benzene rings

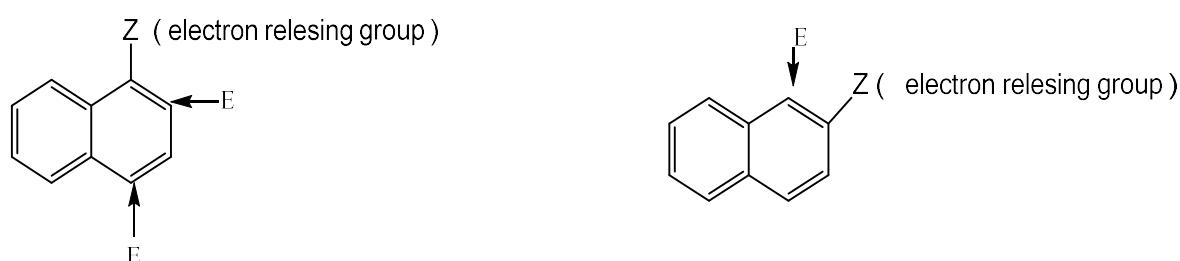


4 resonance structures. One structure (F) has full benzene ring

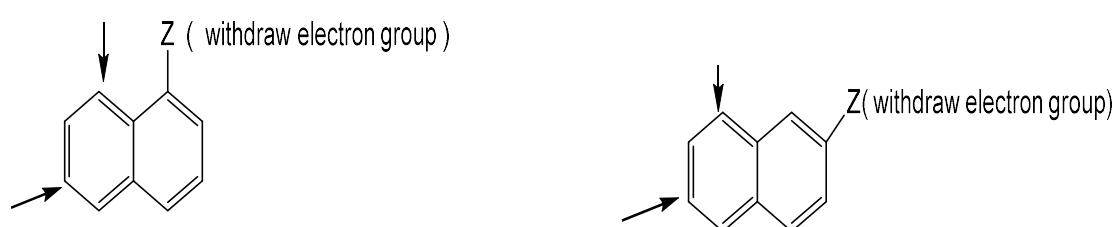
Example:



a- Di donating group:

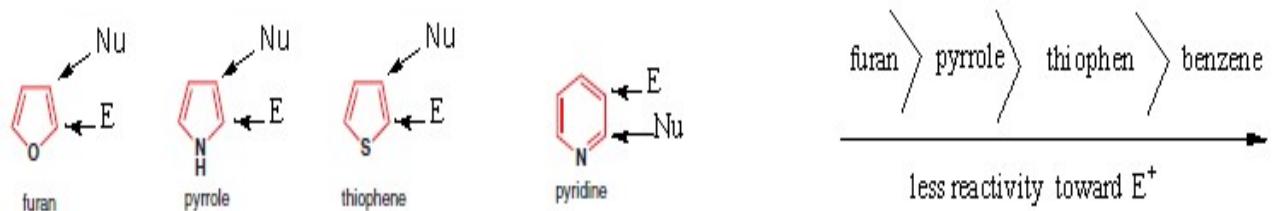


b- Withdrawing group:

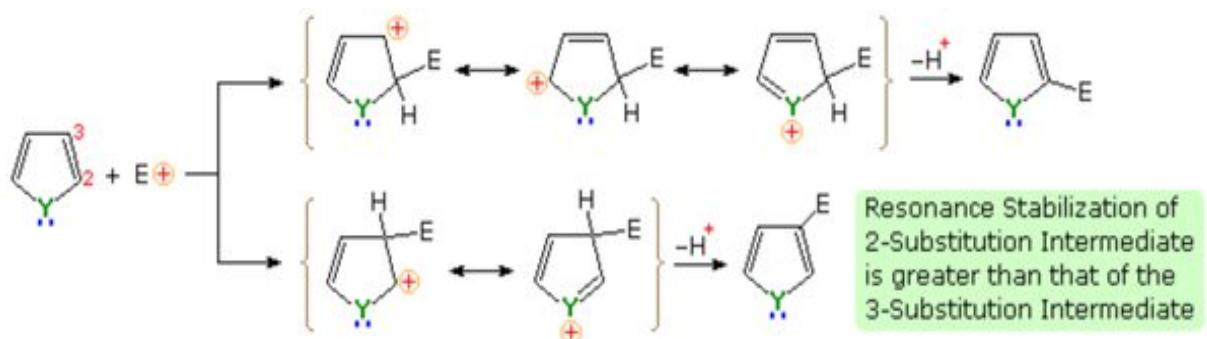


Electrophilic Substitution in heterocyclic compounds [pyrrole ,furan ,thiophen ,pyridine]:

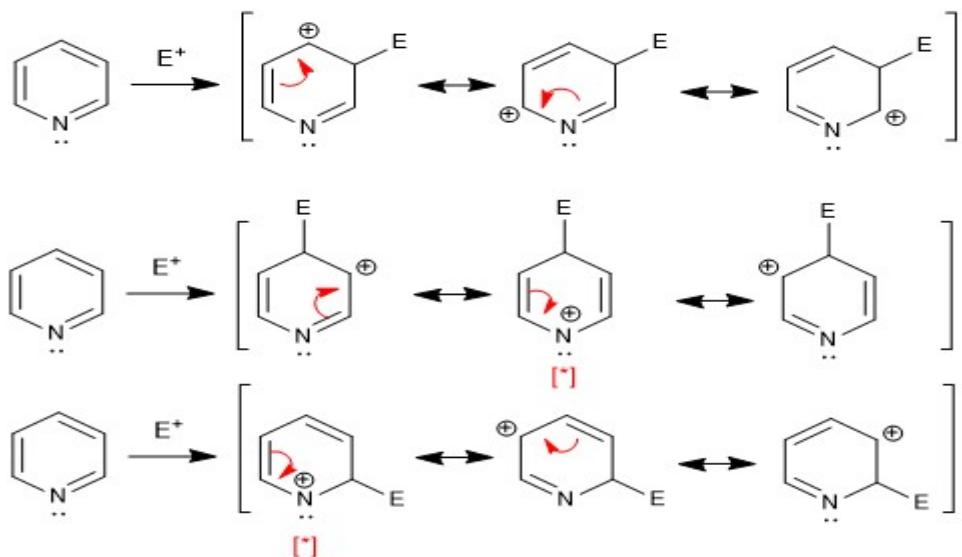
Like other aromatic compounds these **five** and **six member heterocyclic** undergo nitration, sulfanation, and all reaction. These compounds **more active from benzene**.



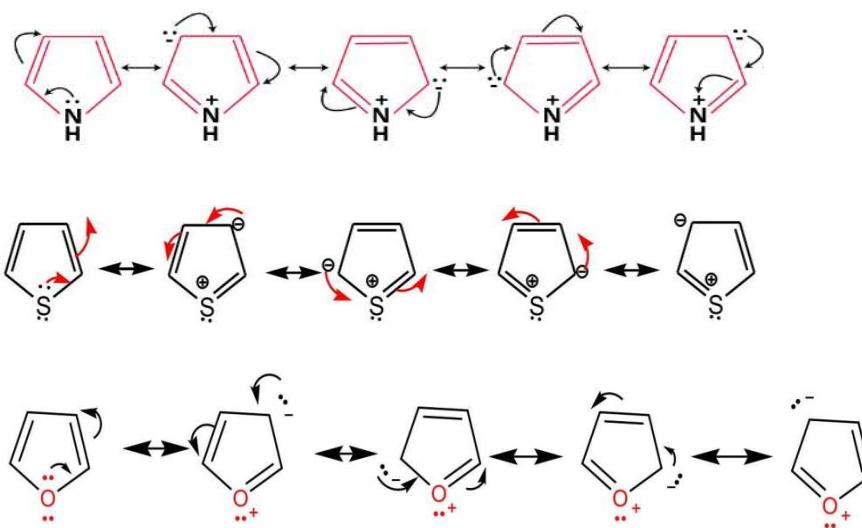
a- five member heterocyclic (O, N, S) inter electrophilic substitution in 2 position:



b- six member heterocyclic inter electrophilic substitution in 3 position:



Why **five member heterocyclic** inter electrophilic substitution in **2 position?**



Examples:

