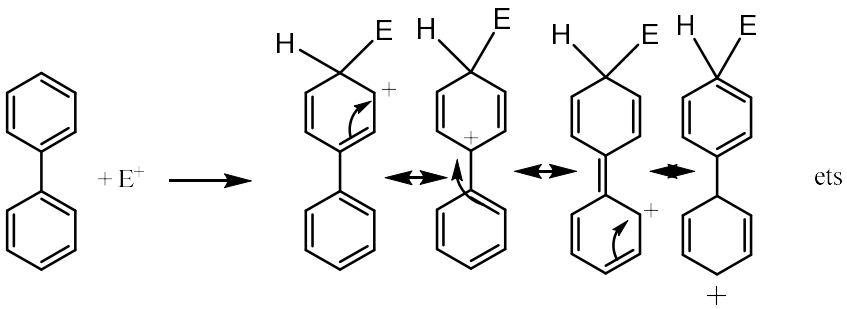
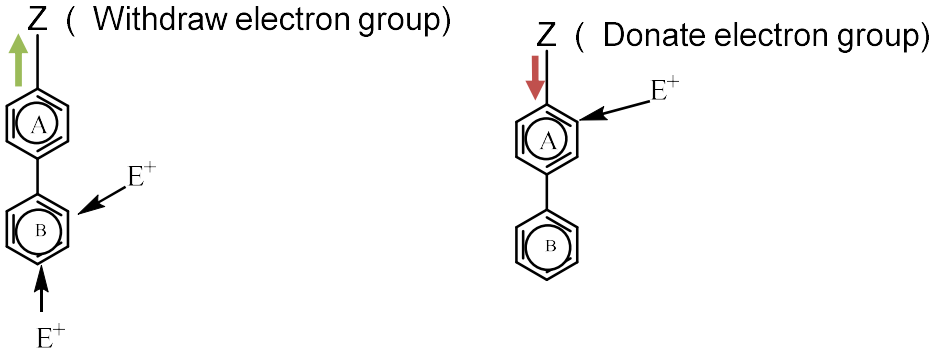
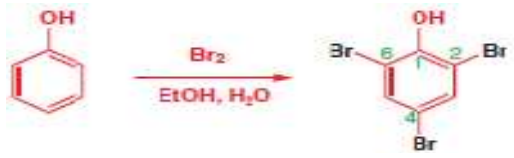
Effect of phenyl substitution on the aromatic ring:(*para*-substitution)

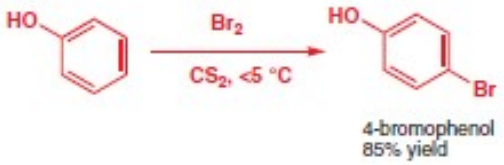


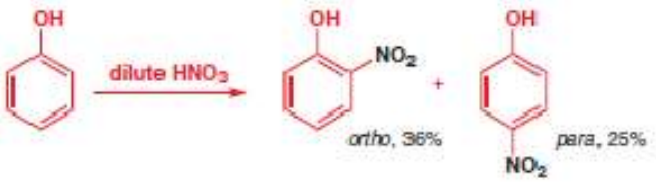
- Effect of withdrawing and donating group:

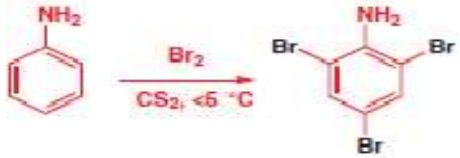


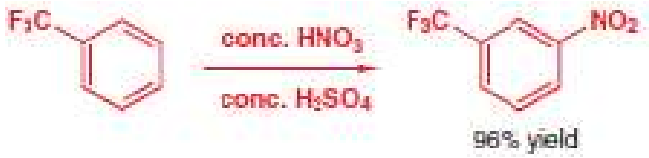
Examples:

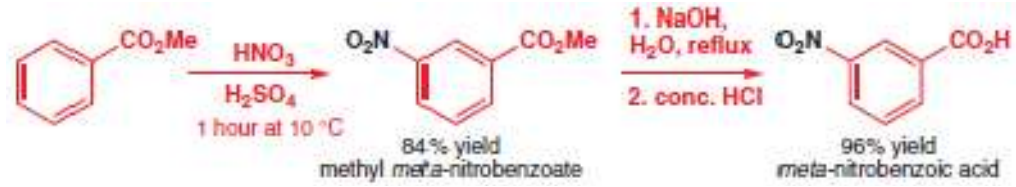


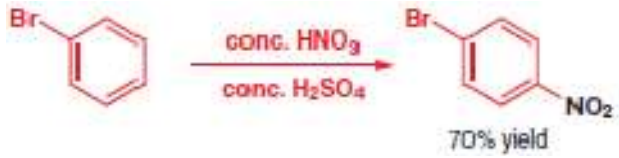








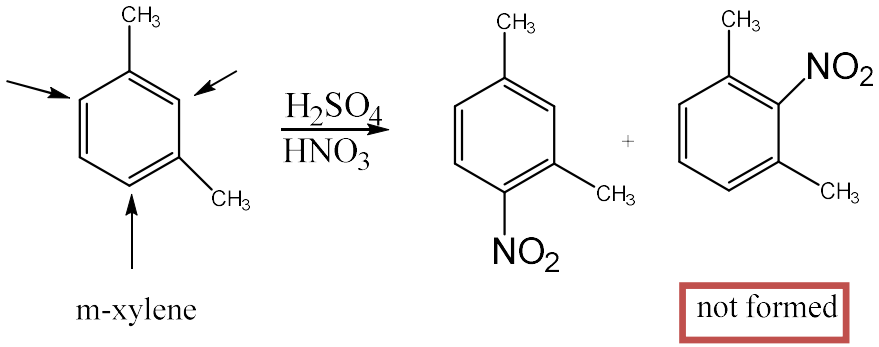


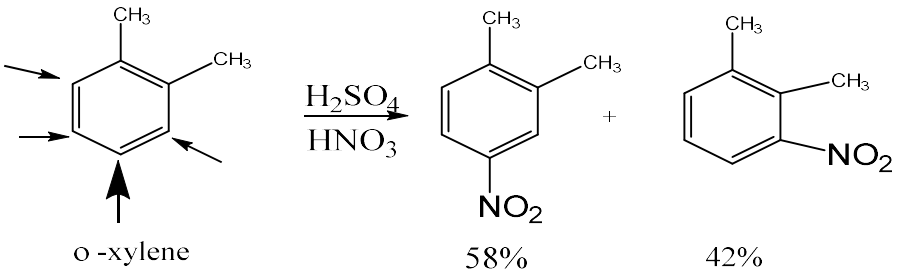


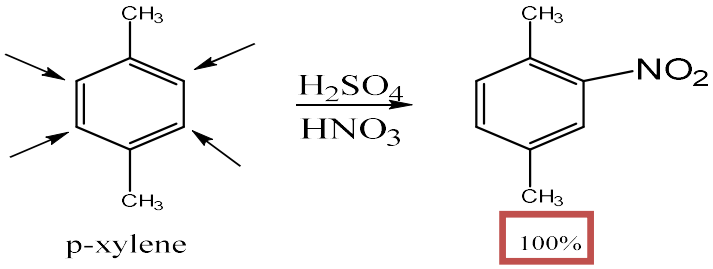
Electrophilic substitution of disubstituted benzene ring:

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

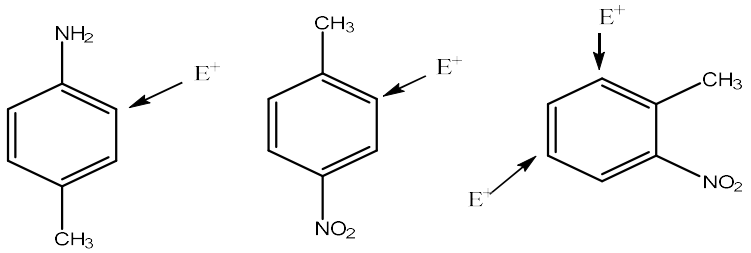
a- Di donating groups:





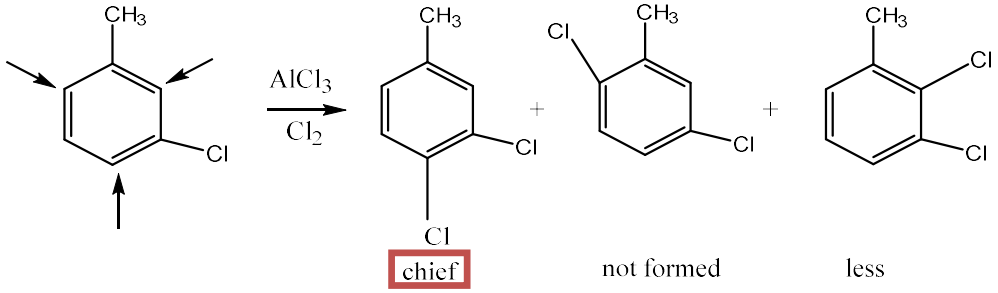


b- Donating and withdrawing groups:



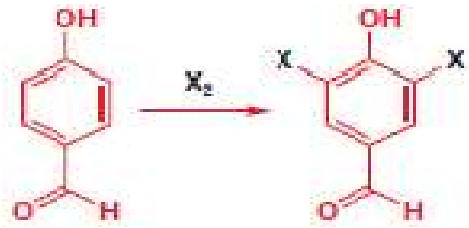
- The presence of groups substituted, one of them ***meta*** position and the other to be the one donate electrons and the other withdrawing electron shown here ***ortho*** **effect** for the group **withdrawing**.

Examples:



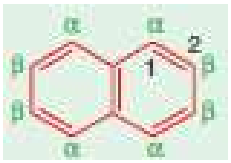
c- Di donating and withdrawing groups:

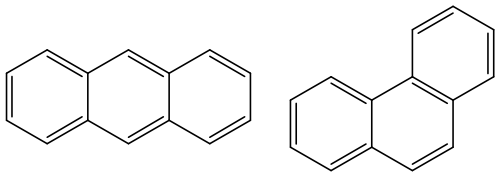
Examples:



Substitution reaction of polynuclear aromatic hydrocarbons:

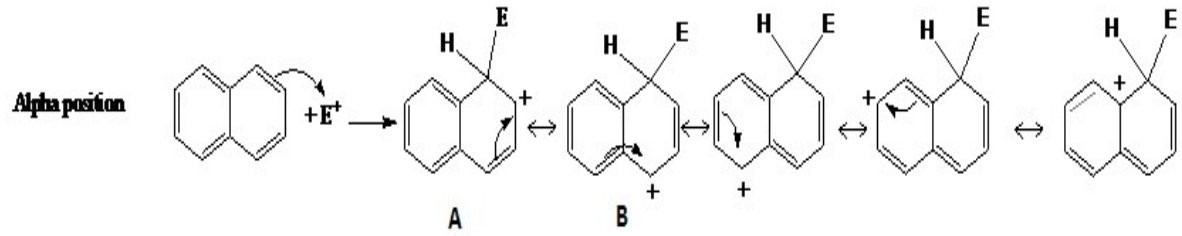
Although **naphthalene**, **phenanthrene** and **anthracene** resemble benzene in many respects, they are **more reactive** than benzene in both **substitution** and **addition reaction**.



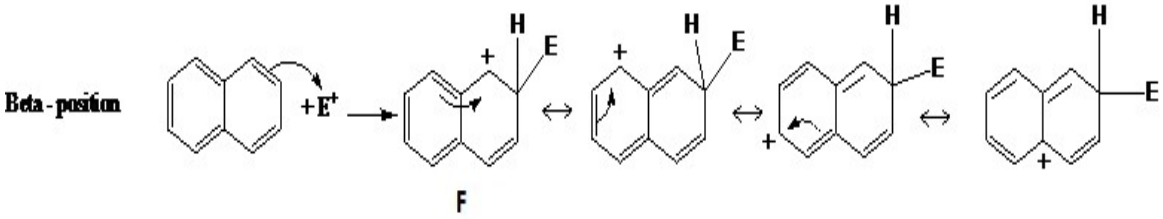


Orientation of naphthalene:

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 in 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**.

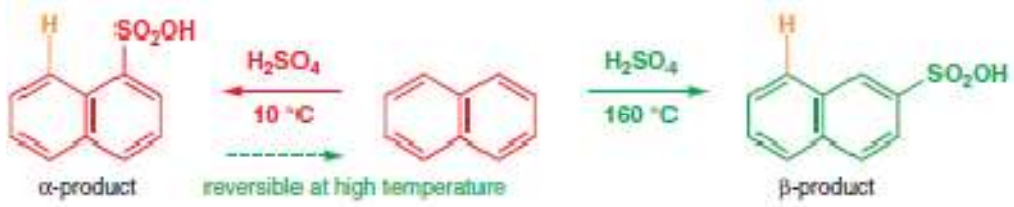


5 resonsnce structures. Two structures (A, B) have full benzene rings

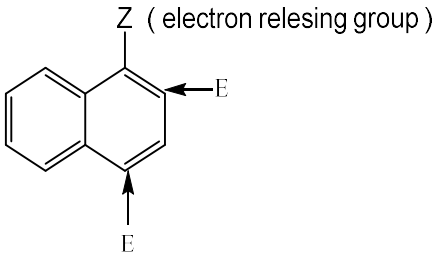


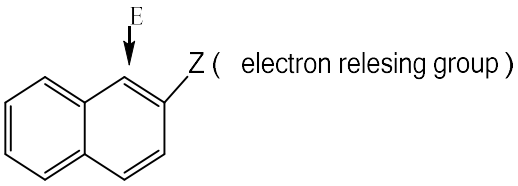
4 resonsnce structures. One structure (F) has full benzene ring

Example:

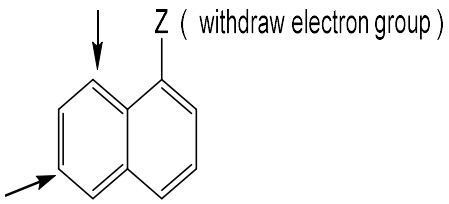


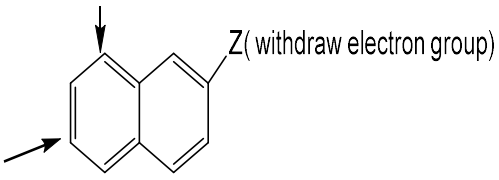
a- Di donating group:





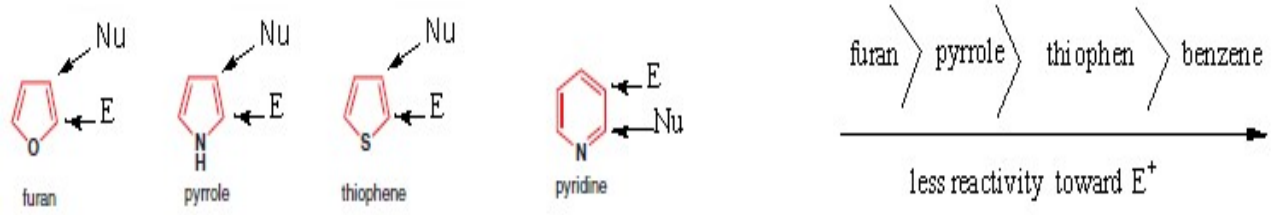
b- Withdrawing group:



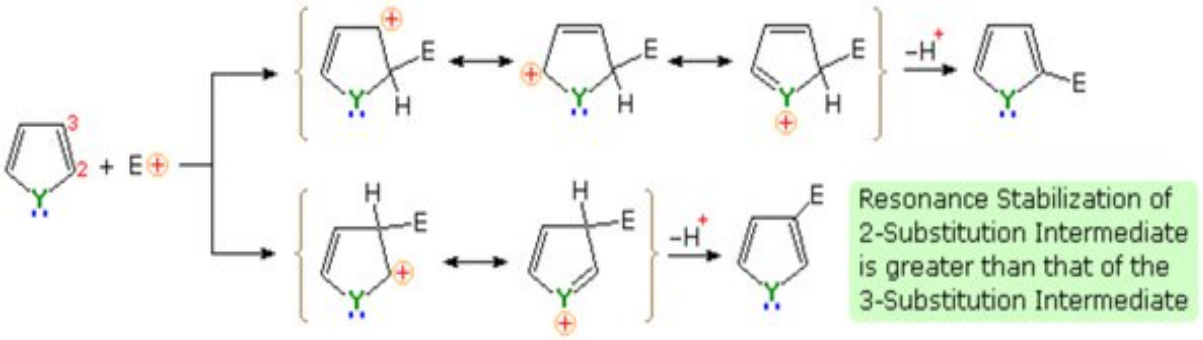


Electrophilic Substitution in heterocyclic compounds [pyrrole ,furan ,thiophen ,pyridine]:

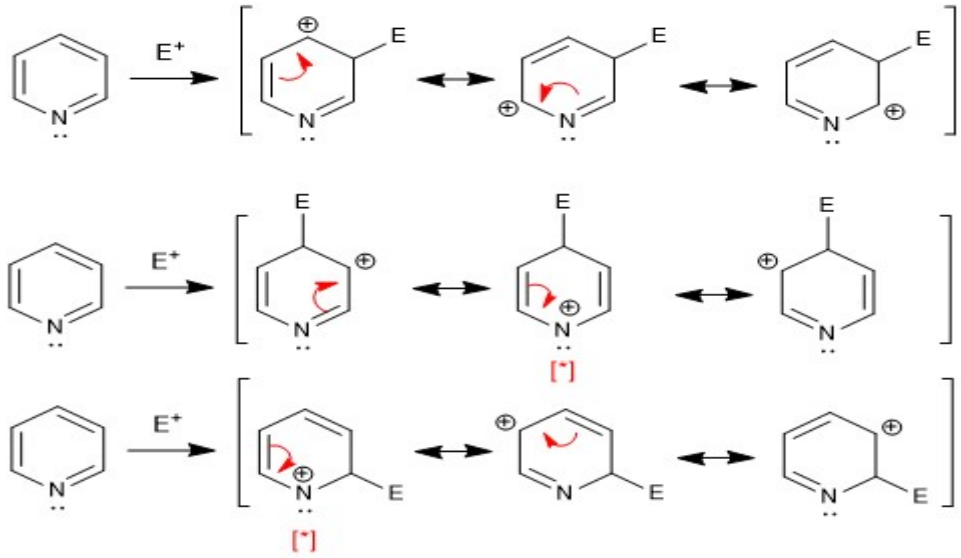
Like other aromatic compounds these **five** and **six member heterocyclic** undergo nitration, sulfanation, and all reaction. These compounds **more active from benzene**.



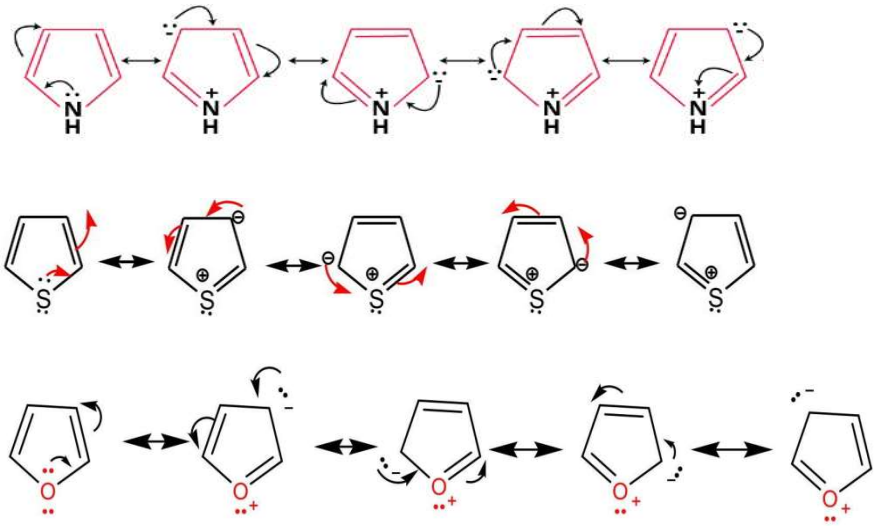
a- **five member heterocyclic (O, N, S)** inter electrophilic substitution in **2 postion**:



b- **six member heterocyclic** inter electrophilic substitution in **3 postion**:



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



Examples: