

dersdeo

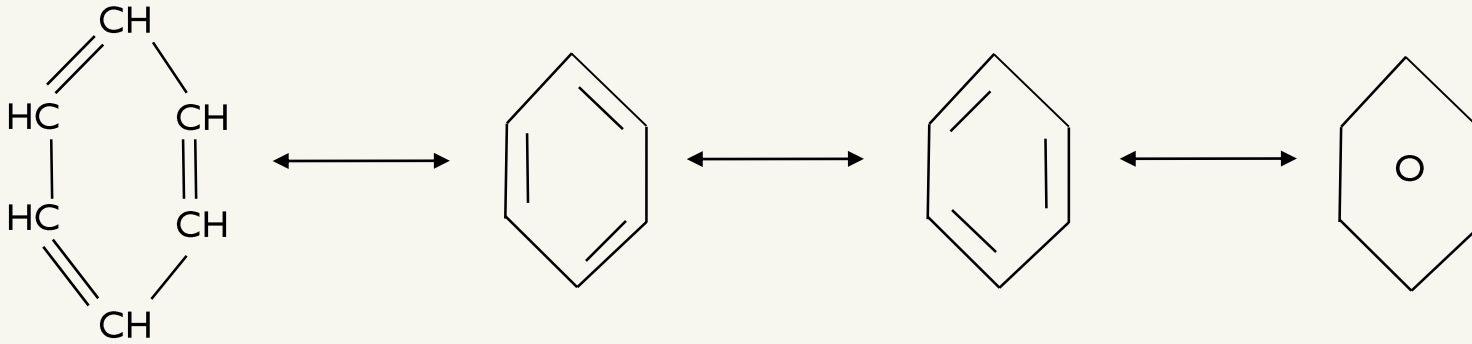
öğrenmenin en kolay yolu o!

KİMYA

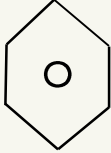
AROMATİK HİDROKARBONLAR (ARENLER)

Benzen ve türevleri (benzen halkası bulunduran bileşikler) aromatik bileşiklerdir.

Benzen, aromatik hidrokarbonların en basit yapısıdır. Formülü C_6H_6 dır.



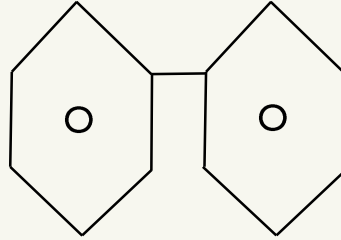
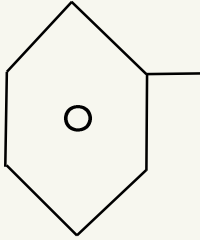
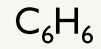
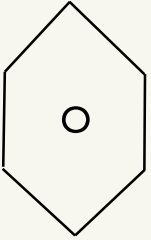
Benzen halkasında karbon atomları arasındaki çift bağların yerleri değişkendir.

Rezonans formülleri göstermek yerine  şeklinde genel bir gösterim kullanılır.

Benzen molekülünde bağ açıları 120° , C atomları sp^2 hibritleşmesi yapmıştır.

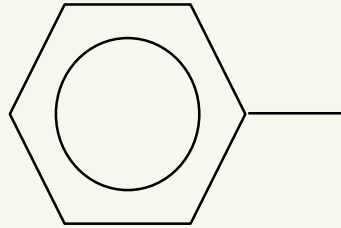
Benzen halkası, doymamış olduğu halde kararlı bir yapıya sahiptir. Katılma tepkimesi vermeye yatkın değildir.

Benzen Türevleri

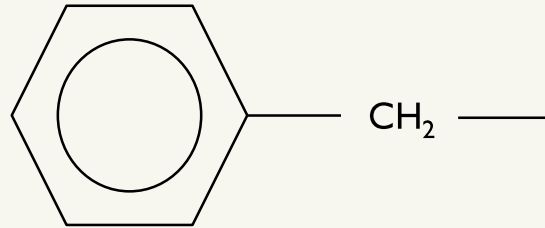


Aril Grupları

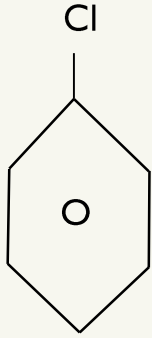
Aromatik hidrokarbonlardan 1 hidrojen atomu çıkarılması ile oluşan gruplara **aril grubu** denir.



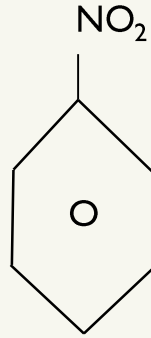
Fenil



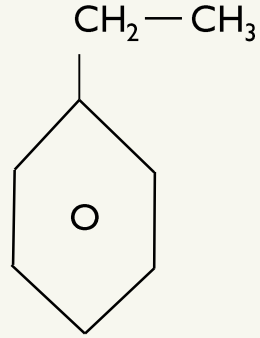
Benzil



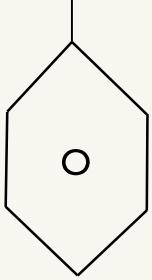
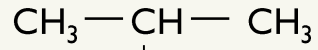
Klor benzen



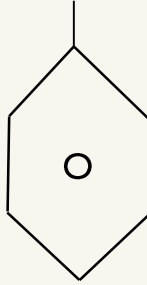
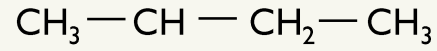
Nitro benzen



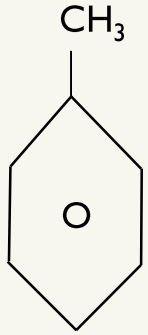
Etil Benzen



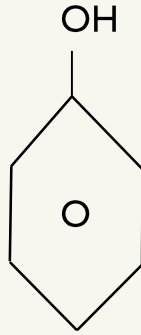
İzopropil benzen
2 fenil propan



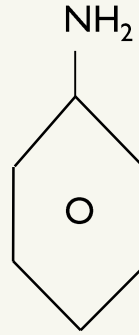
Sec bütıl benzen
2 fenil bütan



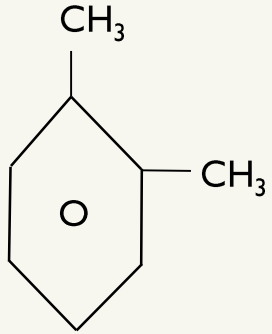
Metil benzen
(Toluen)



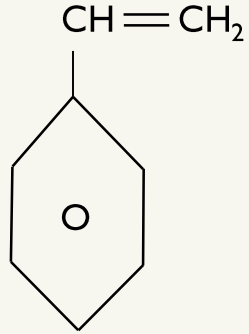
Hidroksi Benzen
(Fenol)



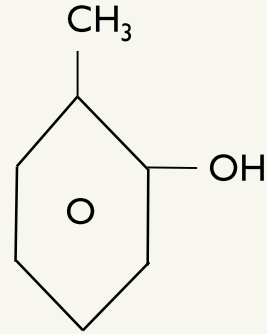
Amino Benzen
(Anilin)



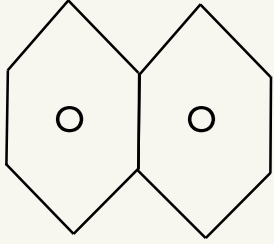
1, 2 di Metil benzen
(ksilen)



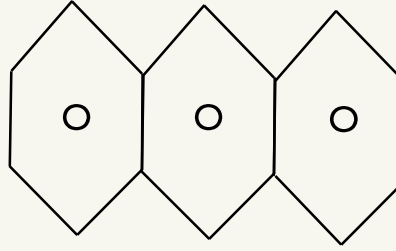
Vinil Benzen
(stiren)



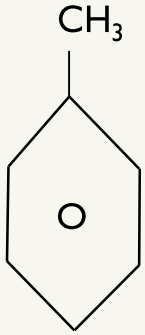
Krezol
(zayıf asit)



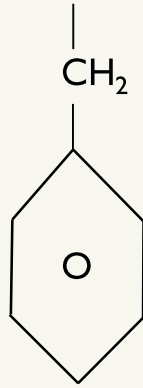
Naftalin



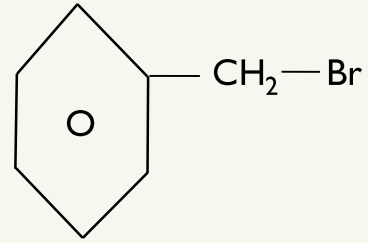
Antrasen



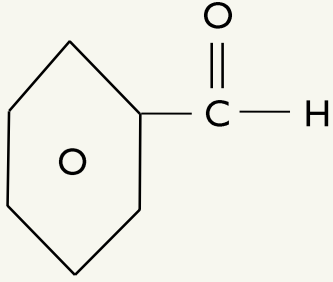
Toluen



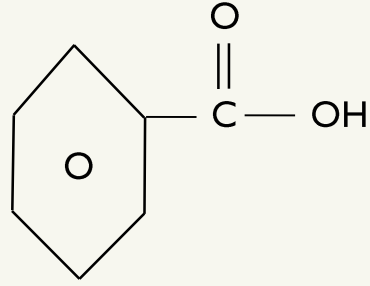
Benzil



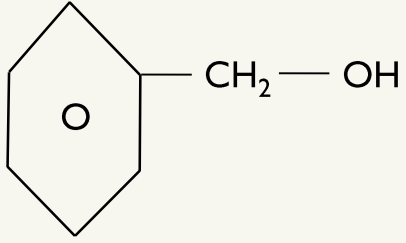
Benzil bromür



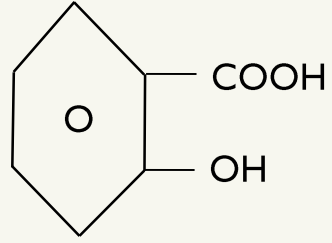
Benzaldehit



Benzoik Asit



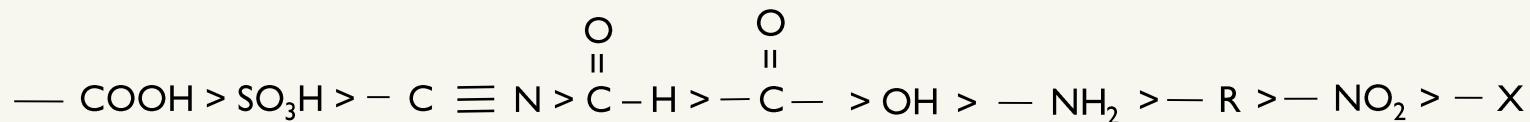
Benzil alkol

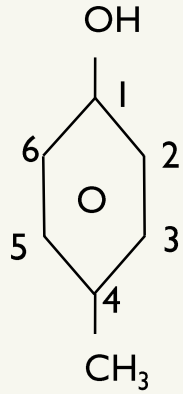


Salisilik Asit

Aromatik Bileşiklerin Adlandırılması

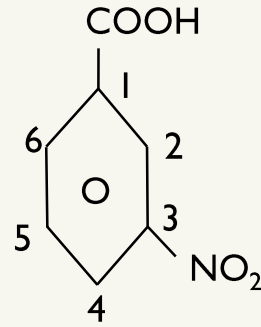
Benzen halkasına birbirinden farklı gruplar bağlıysa, karbon atomları öncelik sırasına göre numaralandırılır.
Öncelik sırası;



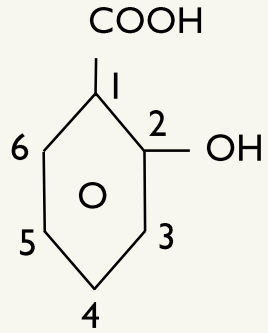


4 metil hidroksi benzen

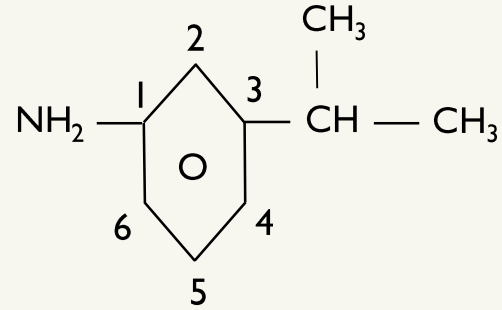
4 metil fenol



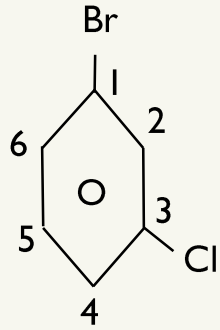
3 nitro benzoik asit



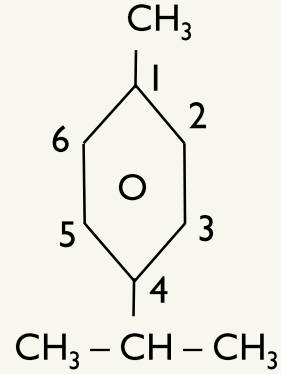
2 Hidroksi benzoik asit



3 İzopropil anilin



1 brom 3 klor benzen



1 metil 4 izopropil benzen

4 izopropil toluen

Aromatik bir bileşiğin bazı özellikleri;

- ❖ Halkalı yapıdadır.
- ❖ Molekül tek düzlemedir.
- ❖ Halka içindeki π e sayısı $(4n + 2) \pi$ dir.

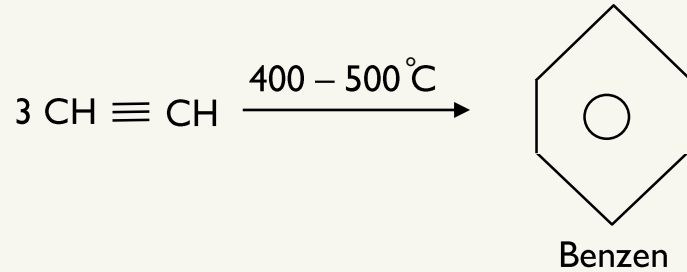
n: halka sayısı

Benzen $\longrightarrow (4n + 2) \pi = 6\pi$ e sayısı (3π bağı)

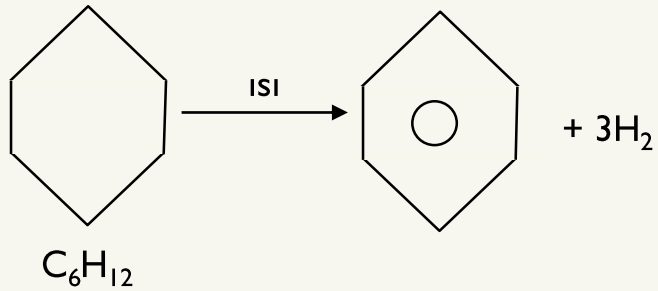
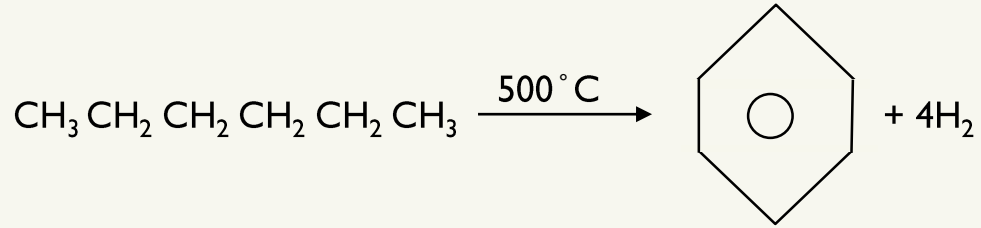
Naftalin $\longrightarrow (4n + 2) \pi = 10 \pi$ e sayısı (5π bağı)

Benzenin Elde Edilmesi

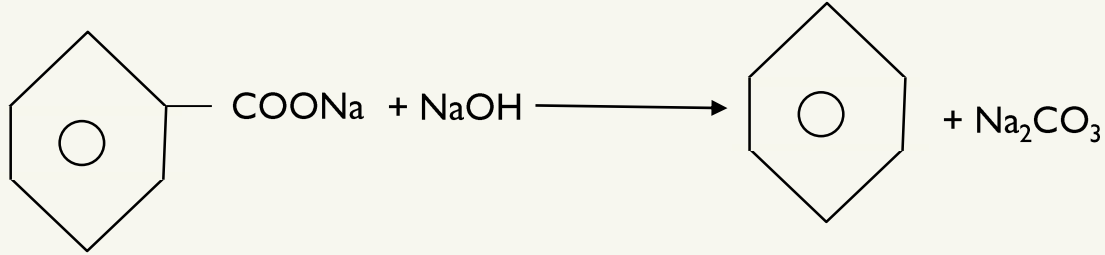
- 1) Benzen ve türevlerinin en önemli kaynağı petrol ve taş kömürü katranıdır.
- 2) Asetilenin kızgın bakır tüp içinden geçirilmesiyle benzen elde edilir.



3) Alkanlardan Cr_2O_3 , Al_2O_3 ün katalitik etkisi ile yüksek basınç ve 500°C sıcaklıkta benzen elde edilir.



4) Benzoik asidin sodyum tuzunun NaOH ile birlikte ısıtılması ile elde edilir.

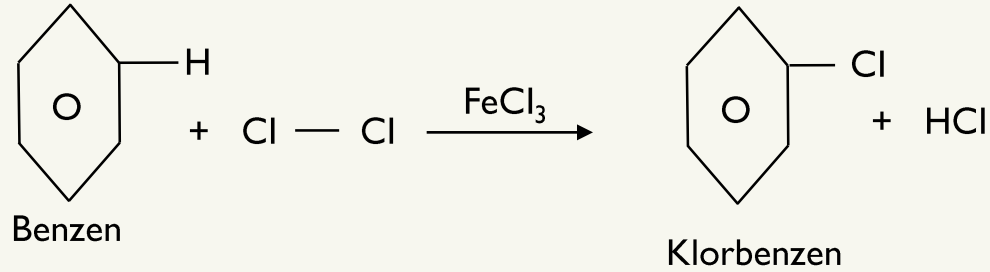


Benzenin Genel Özellikleri

- ❖ Özkütlesi sudan küçüktür.
- ❖ Renksizdir ve karakteristik bir kokuya sahiptir.
- ❖ Toksik ve kanserojen bir maddedir. Laboratuvarlarda gerekli olduğu yerlerde toluen kullanılır.

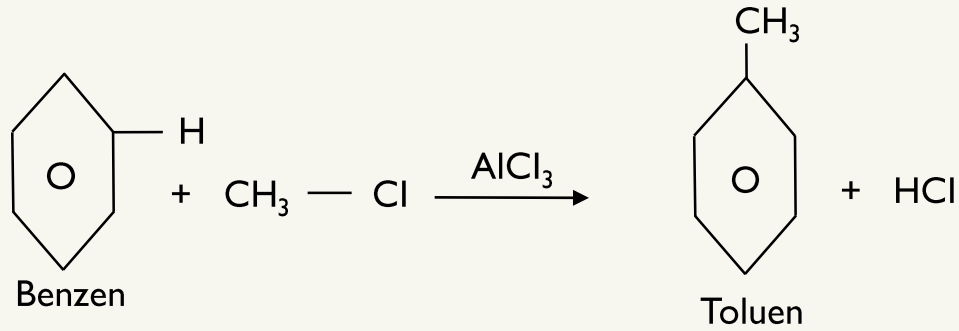
- Polar değildir, suda çözünmez. Aseton, CCl_4 di etil eter gibi çözücülerde çözünürler.
- Benzen halkasında ikili bağ olmasına rağmen katılma tepkimesi vermeye yatkın değildir.

- Aromatik halka, uygun koşullarda yer değiştirme tepkimesi verir.



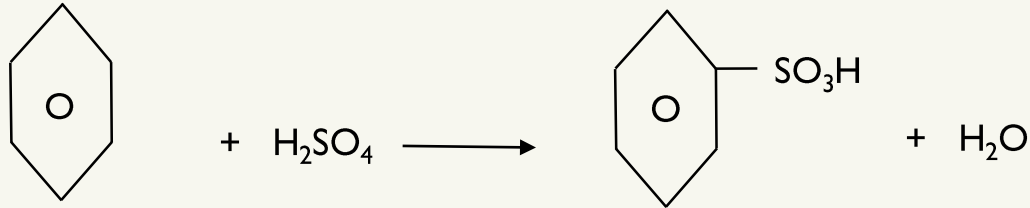
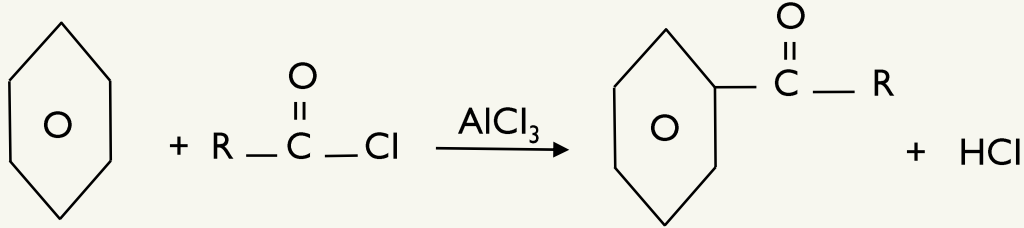
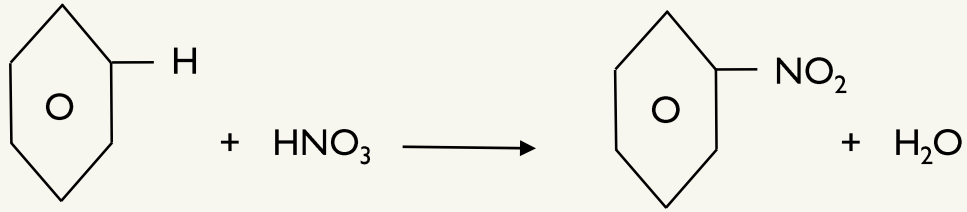
(Elektrofilik yer değiştirme)

- Benzen, Lewis asidi katalizörlüğünde (AlCl_3) alkil halojenürlerle tepkimeye sokulursa benzendeki bir hidrojen ile alkil yer değiştirir. (Fridelcrafts tepkimesi)

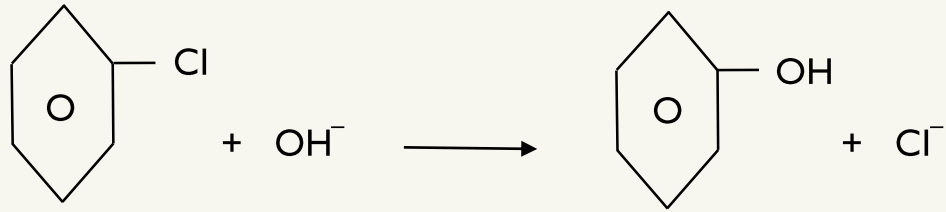


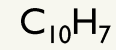
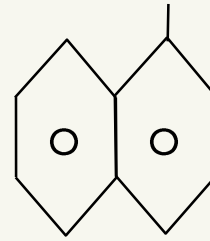
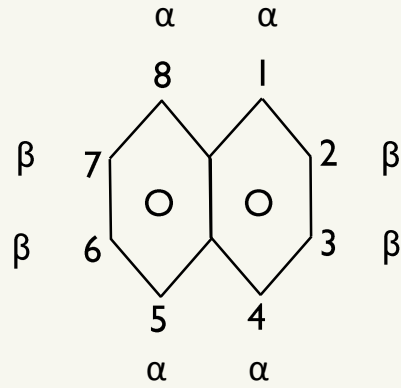
(Elektrofilik yer değiştirme)

Elektrofilik süstitüsyon (yer değıştirme) tepkimesi;

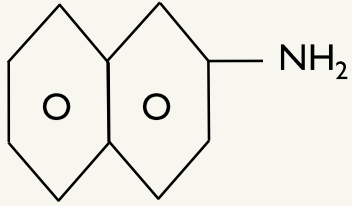


Nükleofilik yer değiştirme;

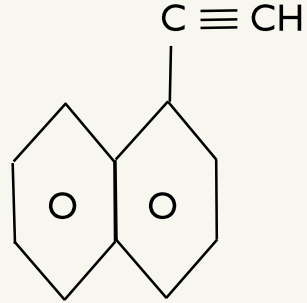




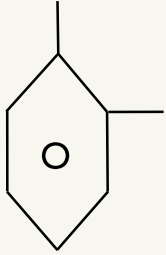
α naftil



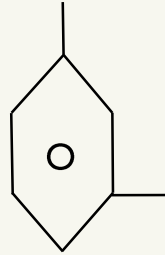
β naftil amin



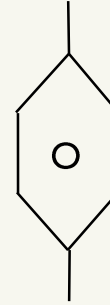
α naftil asetilen



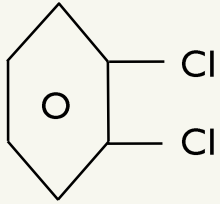
orto



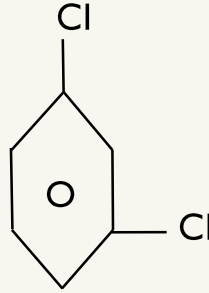
meta



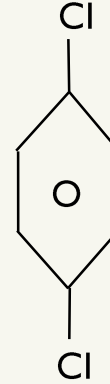
para



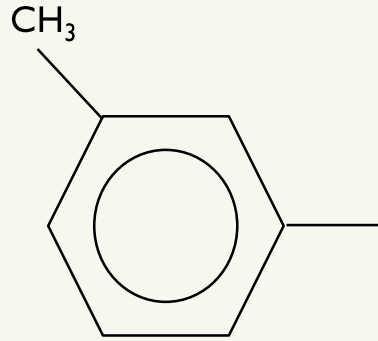
1,2 di klor benzen
(o – di klor benzen)



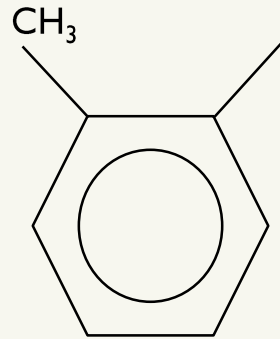
1,3 di klor benzen
(m – di klor benzen)



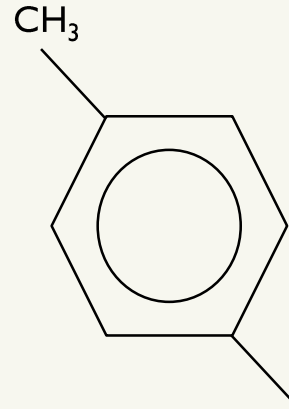
1,4 di klor benzen
(p – di klor benzen)



meta - tolil



orto - tolil



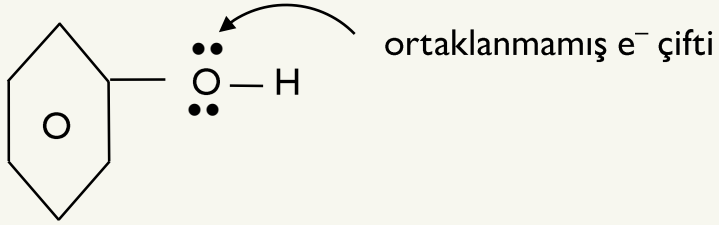
para - tolil

orto – para ve meta Yönlendiriciler

- Benzene önceden bir grup bağlıyken, ikinci bir grup daha bağlanırken başta bağlı olan grup yeni bağlanacak grubu yönlendirir.

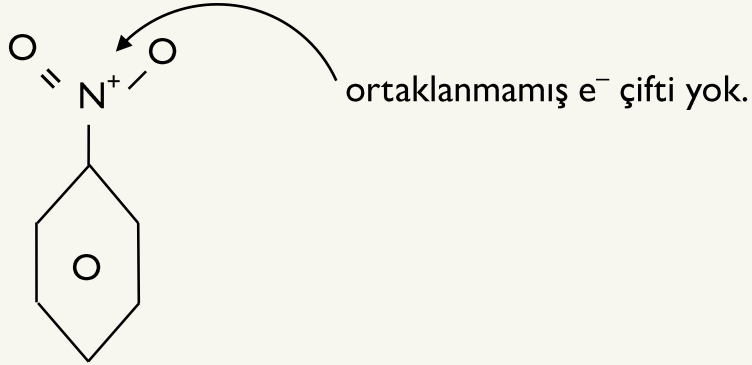
orta ve para Yönlendiriciler

Halkaya bağlı olan atom üzerinde ortaklanmamış e^- çifti varsa, bunları orto ve para yönlendirir. Bu grup, halkaya e^- vererek halkayı etkinleştirir.



meta (m-) Yönlendiriciler

Halkaya doğrudan bağlı olan atom, rezonans yapıdan dolayı kısmi pozitif yük taşır. Bu nedenle halkadan e^- çeker ve halkanın etkinliğini azaltır.



orta – para Yönlendiriciler

Güçlüden
zayıfa
doğru

↓

- NH₂
- OR
- OH
- R
- X

meta Yönlendiriciler

– NO₂

– CN

– SO₃H

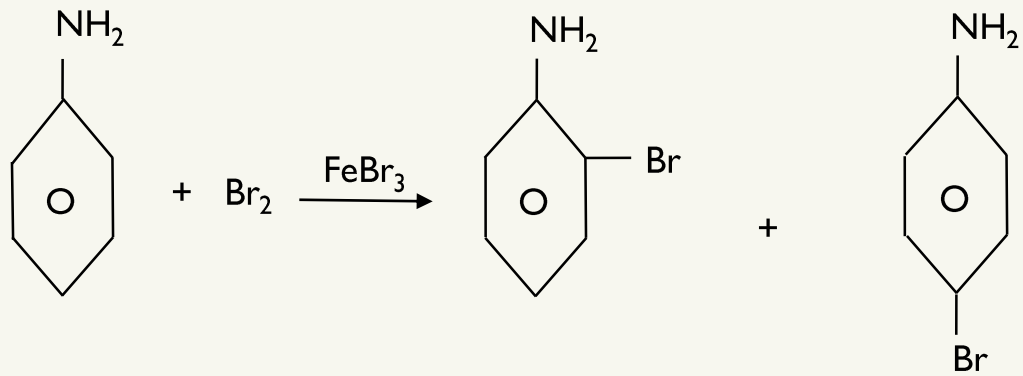
– CHO

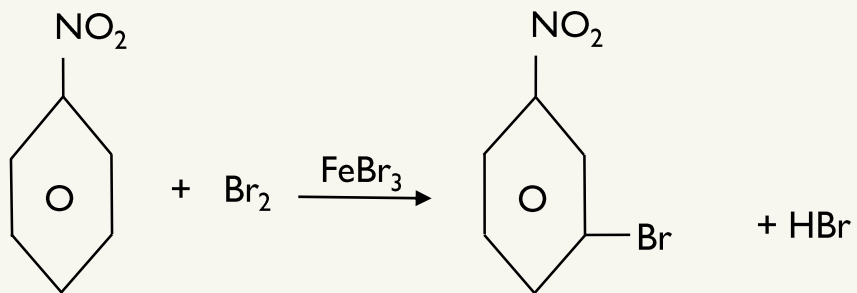
– COOH

– COOR

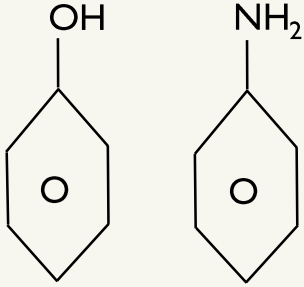
↓

Güçlüden
zayıfa
doğru





ÖRNEK

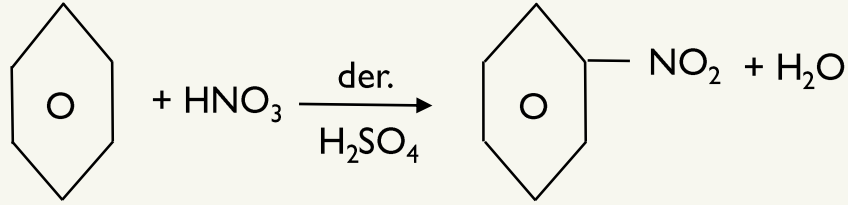


- I) I.si asit, II.si baz özellik gösterir.
- II) I.si o - p - , II.si m- yönlendirir.
- III) II.si nitrobenzenin indirgenmesiyle elde edilir.

Hangileri doğrudur ?

Önemli Aromatik Bileşikler ve Özellikleri

Nitrobenzen

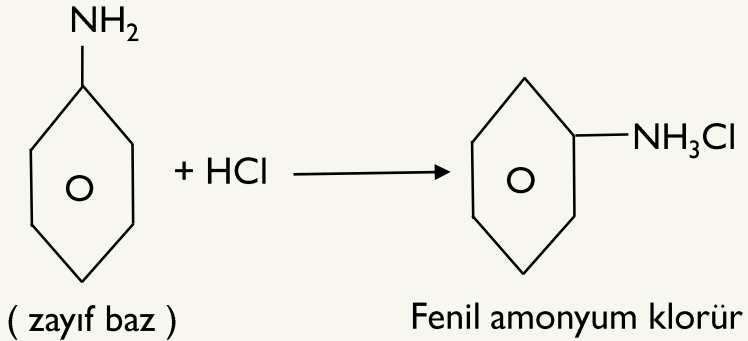
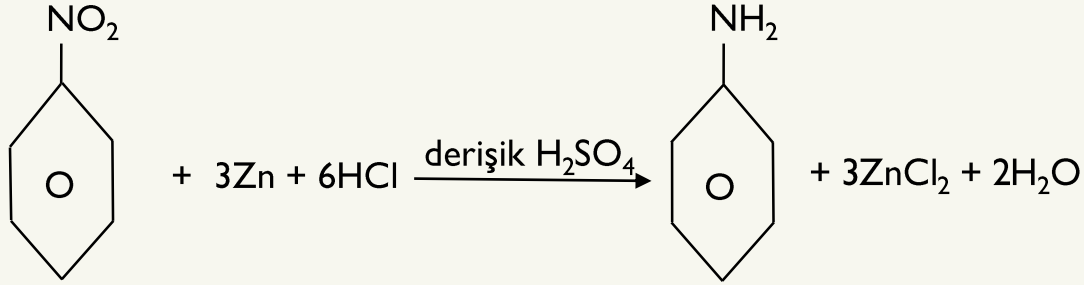


Nitro benzen

Suda çözünmez; asit, baz ve yükseltgenlere karşı dayanıklıdır.

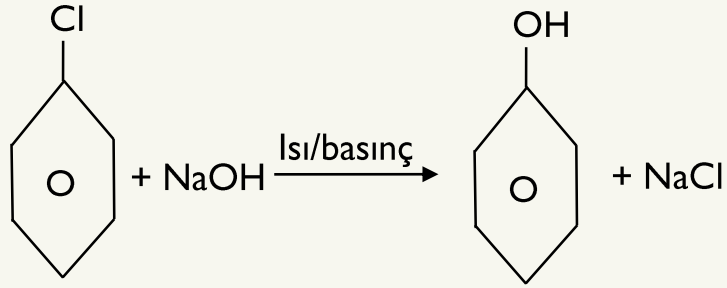
Anilin

– NH_2 grubu, halkaya direk bağlanmaz. Nitro benzenin toz Fe ve Zn ile indirgenmesinden elde edilir.



Fenol

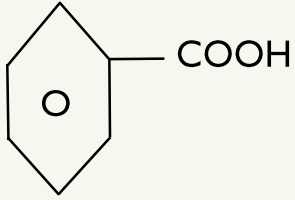
Fenol oluşurken – OH grubu elektrofil olmadığından benzen halkasına doğrudan bağlanamaz .



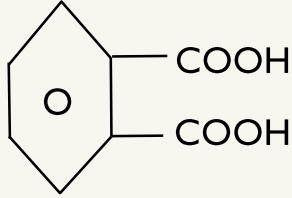
(Dow Yöntemi)

(Nükleofilik yer değiştirme)

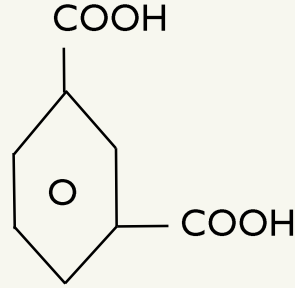
Benzoik asit ve Ftalik asit



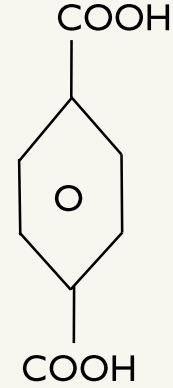
Benzoik asit



Ftalik asit

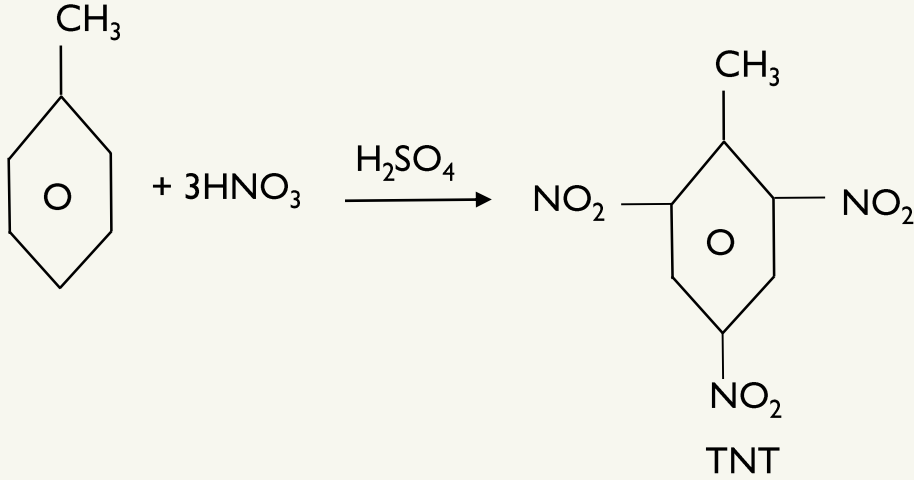


İzoftalik asit



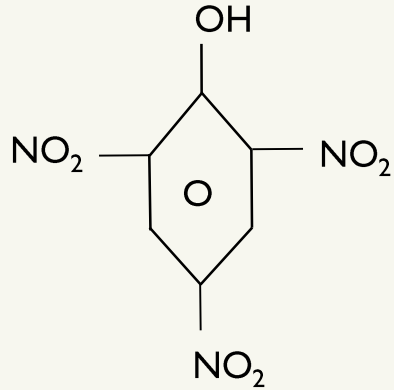
Teraftalik asit

Tri Nitro Toluen



Patlayıcı yapımında kullanılır.

Tri Nitro Fenol



Patlayıcı olarak kullanılır.