

Al-Mustaqbal University College

Department of Medical Physics

First Class

General Chemistry

Lec 6 Aromatic Substitution

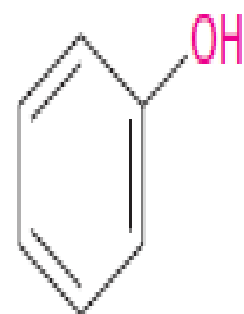
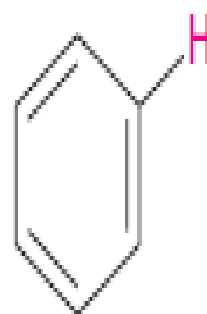
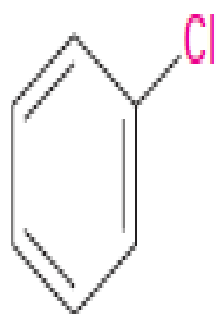
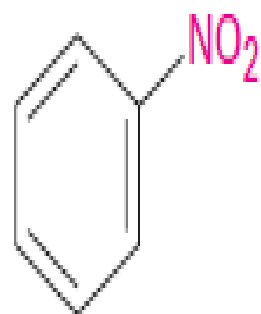
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Substituent Effects in Electrophilic Aromatic Substitution

Only one product can form when an electrophilic substitution occurs on benzene, but what would happen if we were to carry out an electrophilic substitution on a ring that already has a substituent? A substituent already present on the ring has two effects:

1. Substituents affect the reactivity of an aromatic ring.

Some substituents activate a ring, making it more reactive than benzene, and some deactivate a ring, making it less reactive than benzene. In aromatic nitration, for instance, the presence of an -OH substituent makes the ring 1000 times more reactive than benzene, while an -NO₂ substituent makes the ring more than 10 million times less reactive.



Relative rate
of nitration

6×10^{-8}

0.033

1

1000

Reactivity

2. Substituents affect the *orientation* of a reaction

The three possible disubstituted products (ortho, meta, and para) are usually not formed in equal amounts. Instead, the nature of the substituent already present on the ring determines the position of the second substitution. An -OH group directs further substitution toward the ortho and para positions, for instance, while a -CN directs further substitution primarily toward the meta position.

