Reactivity of aromatic rings

Answer all the questions below as fully as you can then check your answers

1. What type of reaction do aromatic rings undergo?

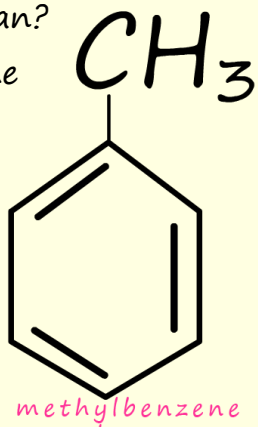
2. Draw a mechanism to show how an electrophile E^+ can add to a benzene ring to form a monosubstituted aromatic compound. Indicate clearly the structure of the intermediate carbocation which is formed.

b. For the intermediate carbocation which forms above draw out the resonance structures to show how this carbocation can be resonance stabilised.

c. What is resonance?

3. If an aromatic ring is said to be activated what does this mean?

a. Toluene contains an activated aromatic ring. Explain how the ring is activated.



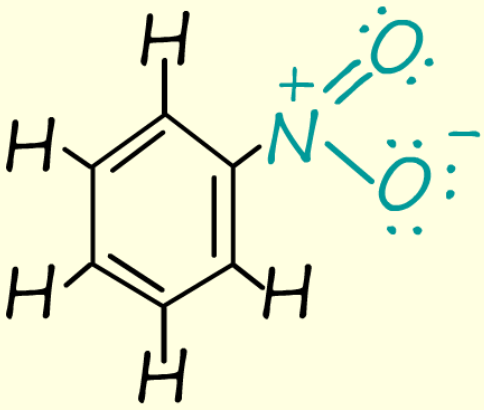
methylbenzene or toluene

b. Toluene or methylbenzene can react with a nitrating mixture of concentrated sulfuric acid and concentrated nitric acid to form nitrotoluene. The nitrotoluene formed is a mixture of mainly two isomers.

i. Draw the structure of these two isomers and name them.

ii. Draw the structure of a third isomer of nitrotoluene that is likely to be formed in small amounts and explain why it is only formed in small amounts.

4. Nitrobenzene can be further nitrated using a mixture of concentrated sulfuric and concentrated nitric acids to form dinitrobenzene.



nitrobenzene

a. Draw resonance structures to show how the nitro group can deactivate the aromatic ring.

b. The electrophile in the nitration of nitrobenzene is the nitronium ion, NO_2^+. Draw the mechanism to show how this electrophile can add to nitrobenzene to form dinitrobenzene. Your mechanism should only show the formation of the major product of this reaction.

5. Phenylamine or aniline is more reactive than benzene towards electrophilic substitution reactions. Explain why.

b. Phenylamine will react with an electrophile E^+ to form mainly a mixture of two isomeric products. Draw the structure of these two isomeric compounds.