

HL Questions on Electrophilic substitution reactions

1. Describe and explain the structure of benzene by considering the hybridization that occurs on each carbon atom.

2. Benzene reacts with a mixture of concentrated nitric and sulfuric acid at a temperature not exceeding 50 °C.
 - i. State the equation for the reaction that occurs.
 - ii. Explain the role of the concentrated sulfuric acid.
 - iii. Identify the electrophile in this reaction.
 - iv. Explain why substitution rather than addition occurs.
 - v. Show the mechanism for this reaction using curly arrows.
 - vi. Suggest a reason why the temperature is not raised above 50 °C.

3. Benzene can also undergo an electrophilic substitution reaction with chlorine in the presence of aluminium chloride, AlCl_3 , to form chlorobenzene.
 - i. Deduce the equation for this reaction.
 - ii. Based on your knowledge of electrophiles suggest the identity of the electrophile in this reaction and deduce the role of aluminium chloride in its formation.

