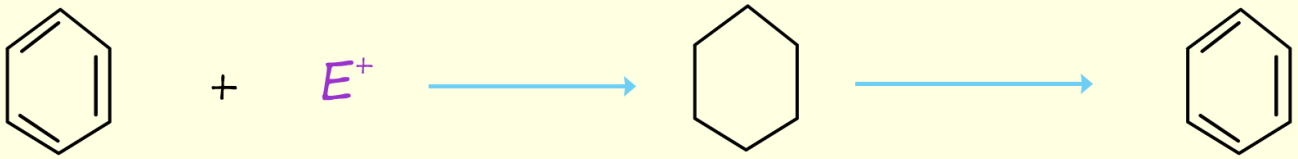
Electrophilic substitution

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

1. What type of reaction would you expect from aromatic compounds?
2. What is an electrophile and a nucleophile?
3. Why are aromatic rings stable molecules?
4. What is resonance?
5. Complete the mechanism below to show how an electrophile (E+) adds to a benzene ring. Show clearly the structure of the intermediate cation formed.



E^+ represents an electrophile

6. Addition of an electrophile to benzene is likely to be an endothermic process since benzene is a very stable molecule, due to the delocalisation of the six pi(π) electrons.

a. Explain how the intermediate carbocation, which is formed in the above mechanism, is much more stable than a typical carbocation.

b. Draw a diagram to show how the intermediate carbocation is resonance stabilised.

Answers

1. What type of reaction would you expect from aromatic compounds?

   Aromatic substances undergo electrophilic substitution reactions.

2. What is an electrophile and a nucleophile?

   An electrophile is an electron deficient species, whereas a nucleophile is an electron rich species.

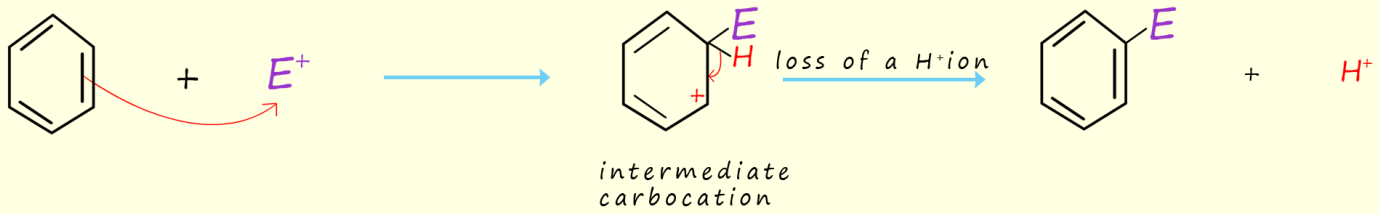
3. Why are aromatic rings stable molecules?

   The extra stability of aromatic molecules is associated with the delocalisation of the six pi(π) electrons.

4. What is resonance?

   Resonance is where the electrons within a molecule/ion move freely but the nuclei of the atoms stay in place. The presence of resonance within a molecule/ion will result in extra stability within the molecule/ion.

5. Complete the mechanism below to show how an electrophile (E+) adds to a benzene ring. Show clearly the structure of the intermediate cation formed.



6. Addition of an electrophile to benzene is likely to be an endothermic process since benzene is a very stable molecule, due to the delocalisation of the six pi(π) electrons.

a. Explain how the intermediate carbocation, which is formed in the above mechanism, is much more stable than a typical carbocation.

   The intermediate carbocation is resonance stabilised, the presence of resonance within a structure will make it much more stable than might have been expected.

b. Draw a diagram to show how the intermediate carbocation is resonance stabilised.