

3.2.10 aromatic chemistry

structure of benzene

- benzene formula: C_6H_6
- planar cyclic molecule and non-polar
- each carbon is bonded to two other carbons in a ring and one hydrogen
- the bond lengths between the carbon atoms in benzene are equal, and form the basis of the ring
- π -electrons are made up of the carbon atom orbitals to form a ring of delocalised electron (delocalised system) or electron
- all the bonds in the ring are the same length. $\rightarrow$ trigonal planar which is an indication of the $C-C$ (134pm) and $C-H$ (109pm)



ring of delocalised electron can be represented by a circle in the ring of carbon-carbon bonds (circle model)

delocalised π system means benzene more stable



stability of benzene

benzene's unusual structure: Chemical systems $\rightarrow$ 1,3,5-triene



benzene proposed that benzene occurred in a ring and single bonds

predicted with the structure:

- benzene should undergo addition reactions
- benzene is "aromatic" more stable than benzene's structural isomers $\rightarrow$ 1,3,5-triene
- bond lengths: $C-C$ (134pm) $C-H$ (109pm)
- in benzene all bonds are 139pm

what unexpected structural change of hydrogenation for benzene with the structural change of hydrogenation for 1,3,5-triene? but the ring structure is not even stable



hydrogenation for the double bond
this is $\rightarrow$ hydrogenation the structural change is $\rightarrow$ "aromatic"



if benzene had three double bonds
expected structural change of hydrogenation would be $\rightarrow$ "aromatic"



benzene the experimental structural change of hydrogenation of benzene is $\rightarrow$ "aromatic"

benzene is more stable than 1,3,5-triene
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benzene is more stable than 1,3,5-triene

aromaticity evidence

benzene: aromaticity evidence in benzene ring

what happens if the benzene ring is
put in a structural group: stable $\rightarrow$ benzene



what happens if the benzene ring is
put in a structural group: stable $\rightarrow$ benzene



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aromaticity

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benzene has the same structure as 1,3,5-triene but is more stable

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