Cambridge (CIE) A Level Chemistry

Your notes

Shapes of Aromatic Organic Molecules; σ & π Bonds

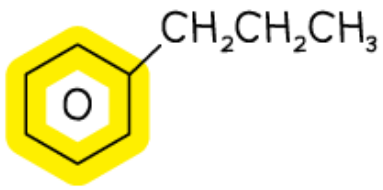
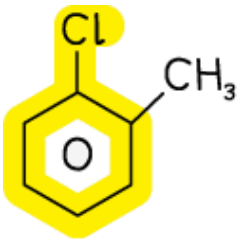
Contents

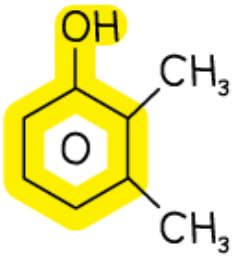
Your notes

Shape of Benzene & Aromatic Molecules

- **Aromatic molecules** consist of one or more rings with **conjugated π systems**
- **Conjugated π systems** arise from alternating double and single bonds in which the electrons are **delocalised**
- Aromatic compounds are called 'aromatic' as they often have pleasant odours

Examples of aromatic compounds table

Functional group	Example	Name
Arene		Propyl benzene
Chlorobenzene		2-methylchlorobenzene
Phenol		2,3-dimethyl phenol

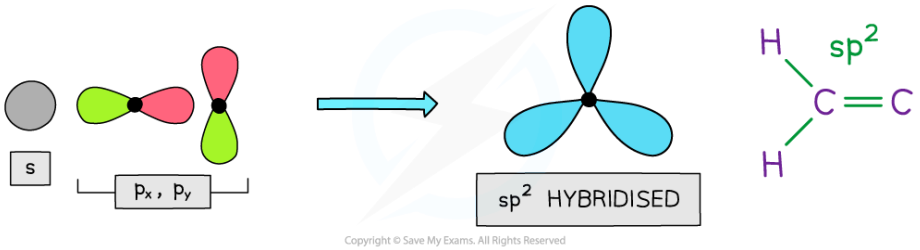
		

Your notes

Shape of benzene & aromatic compounds

- Benzene and other aromatic compounds contain sp^2 hybridised carbons as **two** of their **p** orbitals have mixed with an s orbital
- This means that each carbon atom in benzene and other aromatic compounds has **one p orbital**

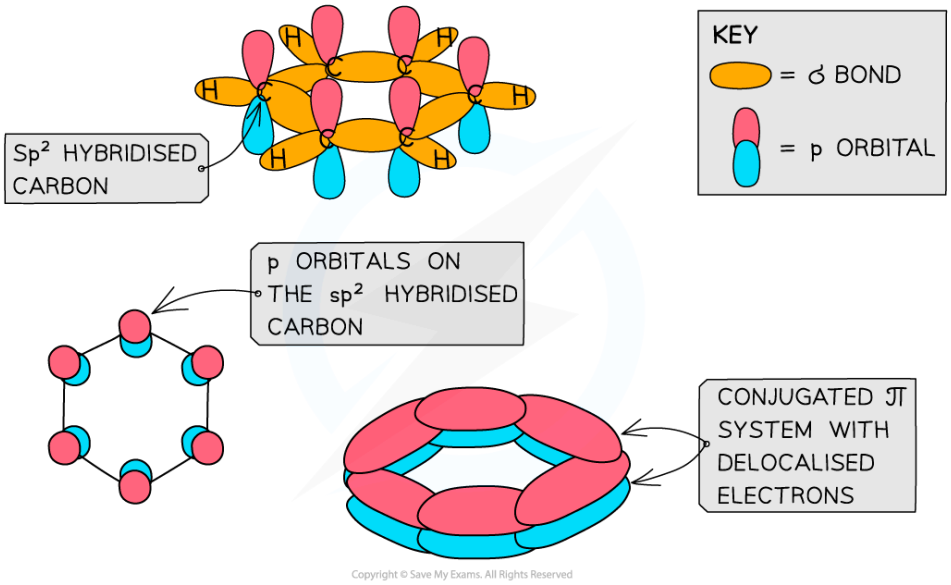
sp^2 hybridisation



The carbon atoms in aromatic compounds are sp^2 hybridised as two of their p orbitals mix with an s orbital

- Each carbon atom in the ring forms three σ bonds using the sp^2 orbitals
- The remaining **p orbital** overlaps laterally with p orbitals of neighbouring carbon atoms to form a π bond
- This extensive sideways overlap of p orbitals results in the electrons being delocalised and able to freely spread over the entire ring
- Benzene and other aromatic compounds are **regular** and **planar** compounds with bond angles of 120°
- The delocalisation of electrons means that all of the carbon-carbon bonds in these compounds are identical and have both **single** and **double bond** character
- The bonds all being the same length is evidence for the delocalised ring structure of benzene

The planar structure of benzene



Like other aromatic compounds, benzene has a planar structure due to the sp^2 hybridisation of carbon atoms and the conjugated π system in the ring

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