

AROMATIC COMPOUNDS

(Lecture-1)

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Topic - Aromaticity

Degree-II (Hons.)
Chapter No.-6
Paper-IV, Group-B
(Organic Portion)

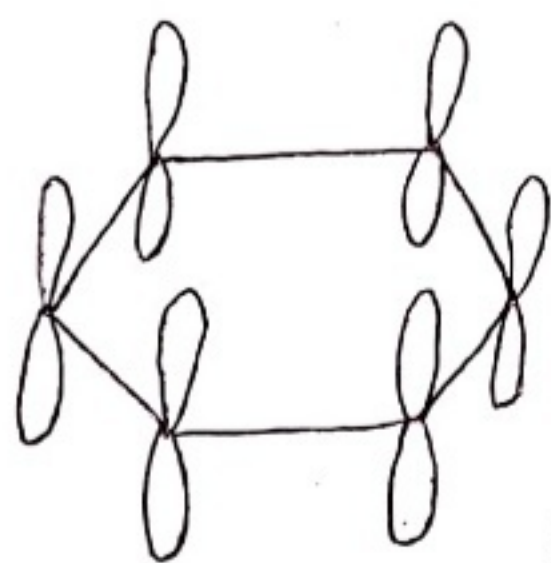
Requirements For Aromaticity :-

Four structural criteria must be satisfied for a compound to be aromatic:-----

Rule 1 :- A molecule must be cyclic.

To be aromatic, each p-orbital must overlap with orbitals on two adjacent atoms.

The p-orbitals on all six carbons of benzene continuously overlap so benzene is aromatic.



* Every p-orbital overlaps with two neighbouring p-orbitals.

Benzene

Rule 2.

All adjacent p-orbitals must be aligned so, that the π -electron density can be delocalized.

Rule 3.

* A molecule must be completely conjugated.
* Aromatic compounds must have a p-orbital on every atom.

A completely conjugated ring.



(a p-orbital on every c)

Benzene \rightarrow "AROMATIC"



\leftarrow No p-orbital

\leftarrow No p-orbital

1,3-cyclohexadiene \rightarrow Not Aromatic



\leftarrow No p-ORBITAL

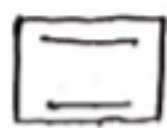
1,3,5-cycloheptatriene \rightarrow Not Aromatic

RULE 4

A molecule must satisfy Huckel's rule, and contain a particular number of π -electrons.

* Some compounds satisfy the first three criteria for aromaticity but still they do not show stability typical of aromatic compounds.

eg; Cyclobutadiene



\leftarrow Planar, Cyclic, completely conjugated
(Not Aromatic)

* Therefore, in addition to being cyclic, planar and completely conjugated a compound needs a particular number of π -electron to be aromatic.

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Erich Huckel first recognized that following criterion, expressed in two parts and now known as Huckel's Rule had to be satisfied as well : - - - -

1. An aromatic compound must contain $(4n+2)$ π -electrons.

where $(n = 0, 1, 2, \dots)$

2. Cyclic, planar and completely conjugated compounds that contain $(4n)$ π electrons are especially unstable, and are said to be antiaromatic.

* Huckel's rule refers to the number of π -electrons, not the number of atoms in a particular ring.

* Thus, compounds that contain 2, 6, 10, 14, 18, \dots π -electrons are aromatic.

n	$(4n+2)$
0	2
1	6
2	10
3	14
4	18 etc..

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