

Aromaticity

Aromaticity is a special property of certain cyclic, planar, conjugated molecules that gives them extra stability compared to non-aromatic compounds.

Conditions for Aromaticity

A compound is aromatic if it satisfies all of the following:

1. Cyclic – forms a closed ring
2. Planar – all atoms lie in the same plane
3. Fully conjugated – continuous overlap of p-orbitals
4. Delocalized π electrons obey Hückel's rule

Hückel's Rule

Hückel's rule predicts whether a planar cyclic conjugated system is aromatic.

Statement

A compound is aromatic if it contains

$$(4n + 2) \pi \text{ electrons, } n = 0, 1, 2, 3, \dots$$

Examples

π Electrons	n value	Nature	
2	0	Aromatic	
6	1	Aromatic	
10	2	Aromatic	
4, 8	—	Anti-aromatic	

Benzenoid Compounds

Benzenoid compounds are aromatic compounds that contain one or more benzene rings.

Characteristics

- Possess benzene ring(s)
- Show resonance stabilization
- Obey Hückel's rule
- Highly stable and undergo electrophilic substitution reactions

Types

1. Mononuclear benzenoid:

- One benzene ring
- *Example:* Benzene, Toluene, Phenol

2. Polynuclear benzenoid:

- Two or more fused benzene rings
- *Example:* Naphthalene, Anthracene, Phenanthrene