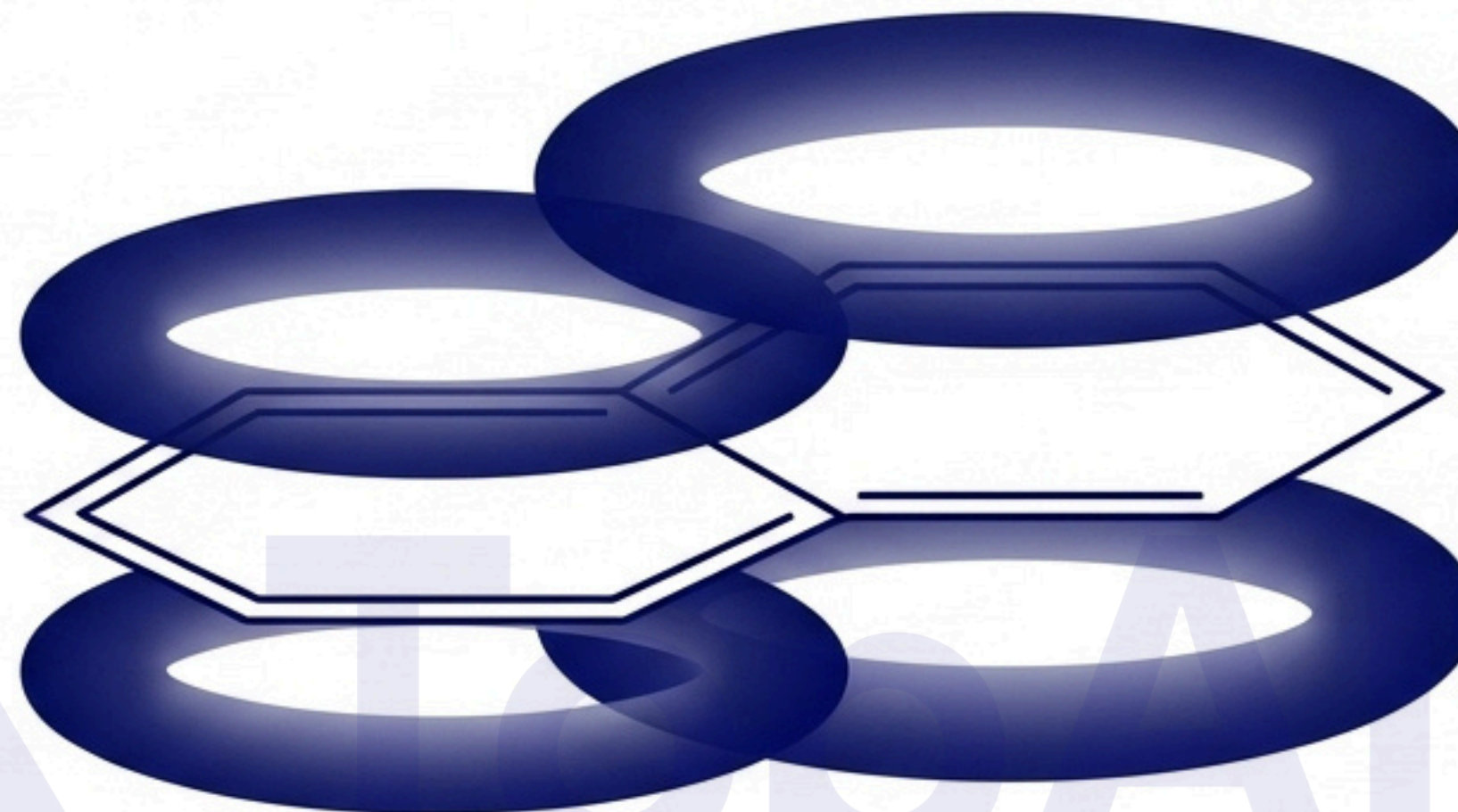


Aromaticity

The 3-Step Gateway
to Chemical Stability



Condition 1



Planarity



Condition 2



**Complete
Delocalisation**



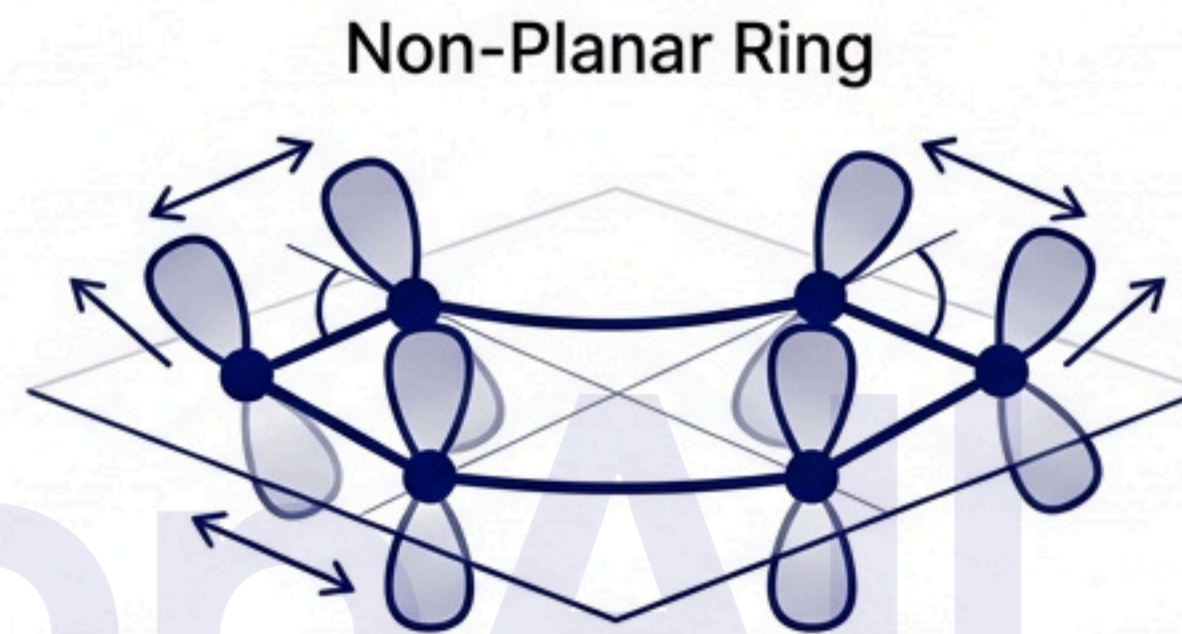
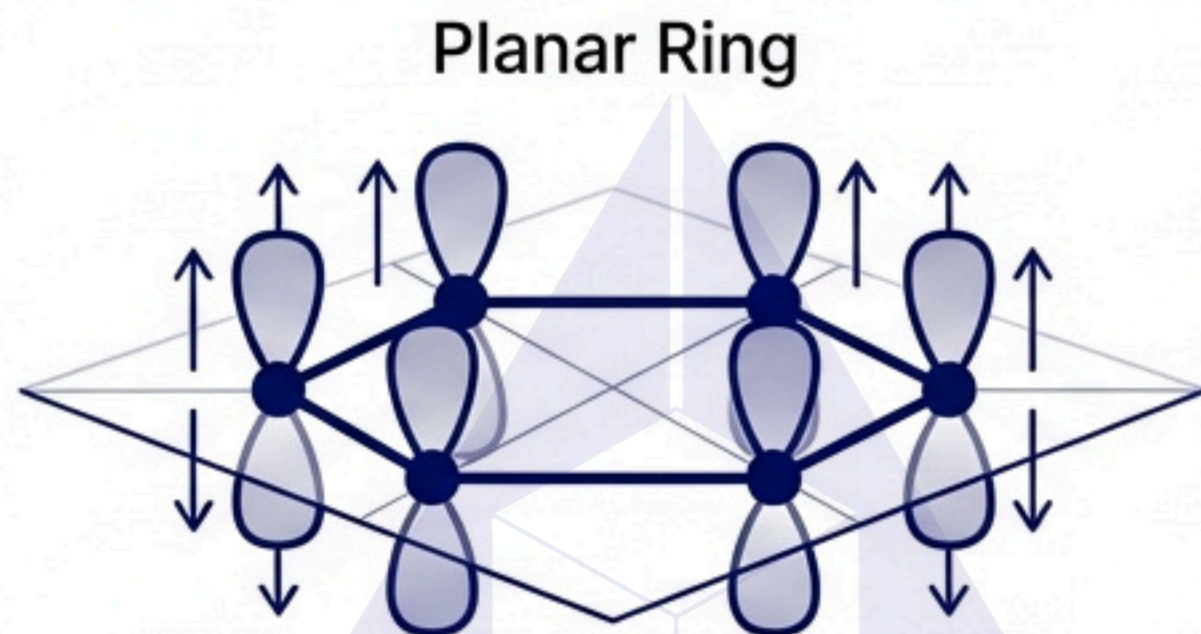
Condition 3

$4n+2$

Hückel Rule

Benzene was the parent aromatic compound, but the term now applies to all ring systems passing these three rigorous structural tests.

The Planarity Requirement



The Flat Ring

All carbon atoms in the system must lie in the exact same 2D plane.

The Purpose

This 2D geometry is the physical prerequisite allowing adjacent, perpendicular unhybridised p-orbitals to perfectly align parallel to one another.

sp^2 hybridized carbons naturally promote planar geometry (120° bond angles)

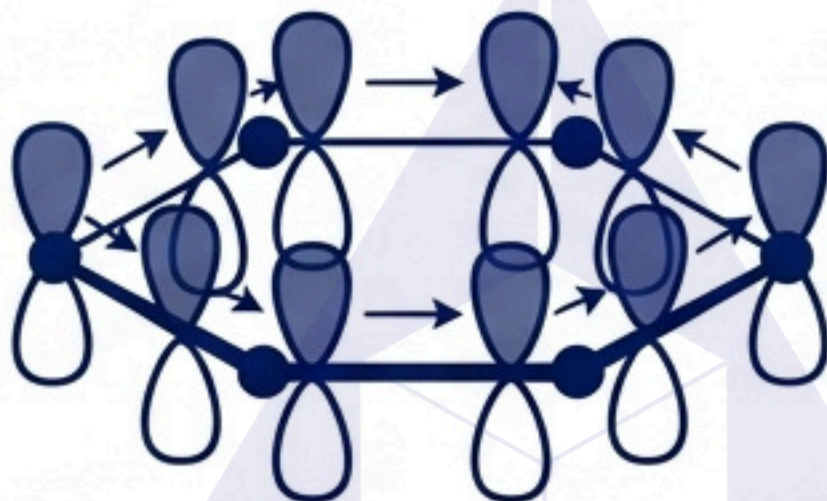
If the molecule isn't physically flat, parallel orbital alignment is impossible. The system fails the test immediately.

Complete Delocalisation

❌ [Localized: Fixed Bonds]

✅ [Delocalised: Freely Moving]

Step A: Lateral Overlap



Step B: Continuous pi-Electron Cloud



Lateral Overlap

The aligned p-orbitals from Condition 1 undergo continuous sideways overlap around the entire perimeter of the ring.

Continuous Cloud

The electrons are not localized between two specific carbons (no fixed double bonds). Instead, they move freely about all nuclei in the ring.

Complete delocalisation creates a unified electron cloud attracted more strongly by the entire ring of nuclei, drastically increasing molecular stability.



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$$E=mc^2$$



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The Hückel Rule

$$[(4n + 2) \pi \text{ electrons}]$$

The Variables

- n must be a whole integer (0, 1, 2, 3...).
- The formula only counts the π electrons that are **fully delocalised within the continuous ring system**.

The Magic Numbers

1	$n = 0$	$\rightarrow$	2 π electrons
2	$n = 1$	$\rightarrow$	6 π electrons
3	$n = 2$	$\rightarrow$	10 π electrons
4	$n = 3$	$\rightarrow$	14 π electrons

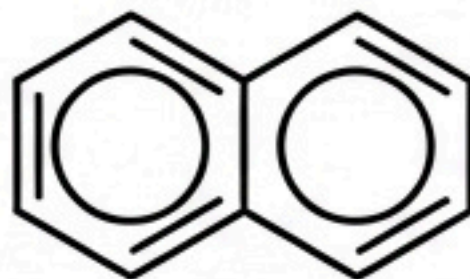
Count the delocalised π electrons in the ring. If the total does not match a magic number (2, 6, 10, 14...), the compound is not aromatic.

Testing Aromatic Systems

Benzene (C₆H₆)

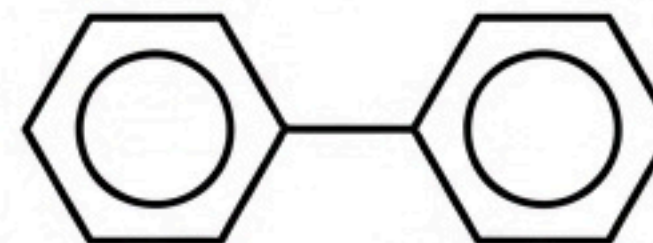
[Pass: Planar]

[Pass: Delocalised]

[n=1: 6 π e⁻]**[AROMATIC]****Naphthalene (C₁₀H₈)**

[Pass: Planar]

[Pass: Delocalised]

[n=2: 10 π e⁻]**[AROMATIC]****Biphenyl**

(Evaluated per ring)

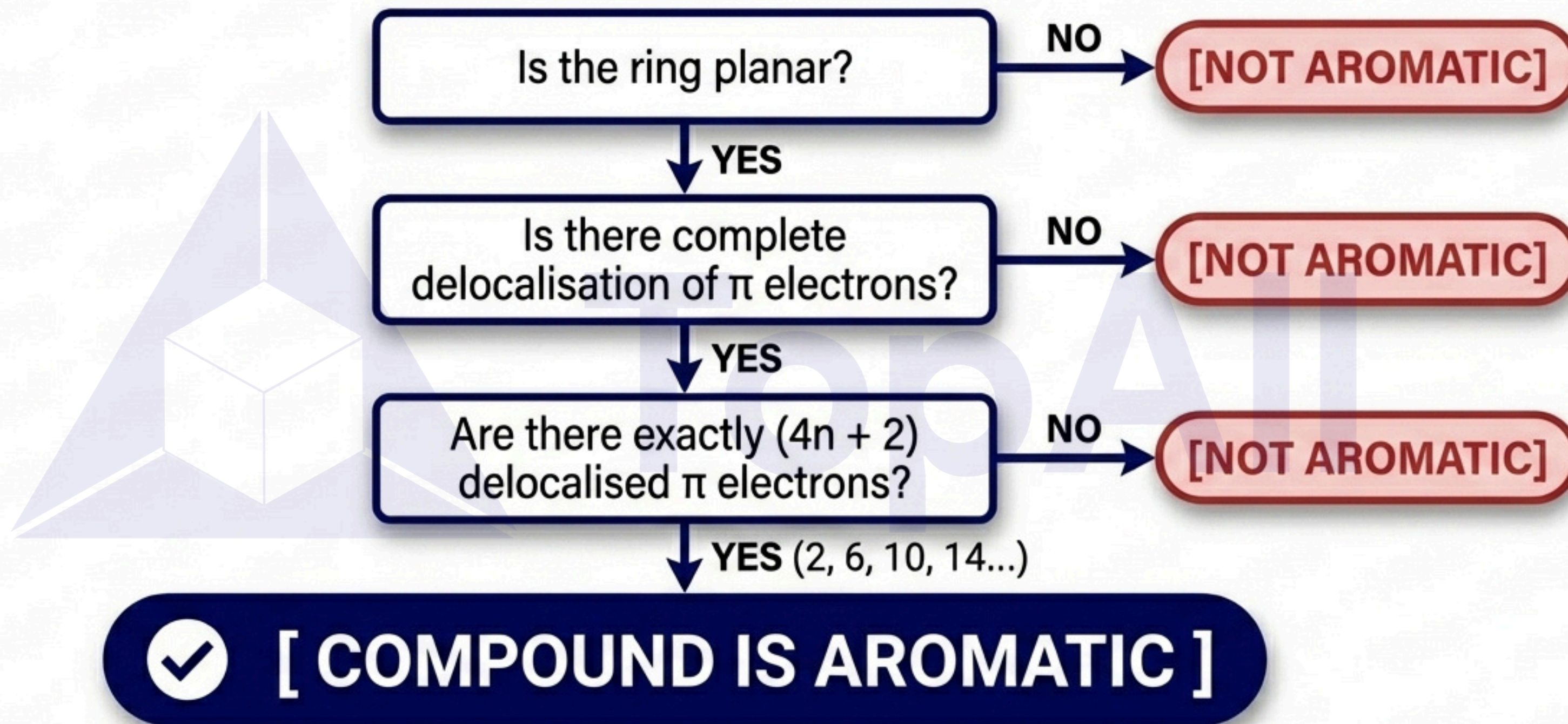
[Pass: Planar]

[Pass: Delocalised]

[n=1: 6 π e⁻ per ring]

Aromaticity is not limited to single benzene rings. Fused systems (Naphthalene) and connected benzenoid systems (Biphenyl) pass the same strict structural rules.

The Aromaticity Diagnostic Checklist



Always apply these rules in order. A molecule must successfully pass through all three checkpoints to achieve aromatic stability.



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