ENGINEERING CHEMISTRY-I AROMATIC SYSTEMS
LECTURE NO-21 23/03/2021 TIME: 10:30 TO 11:20

.Pillai HOC College of Engineering and Technology, Rasayani

Department :- Applied Sciences and Humanities

Subject: Engineering Chemistry –I

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AROMATICITY

Aromaticity

- The term aromaticity is used to describe aromatic compounds properties:
- Highly stable.
- Undergoes substitution reaction rather than addition reaction.
- The C-C bond length (1.39Å), intermediate between single (1.47Å)& double (1.34Å) bonds.

CHARACTERISTICS OF AROMATIC COMPOUNDS

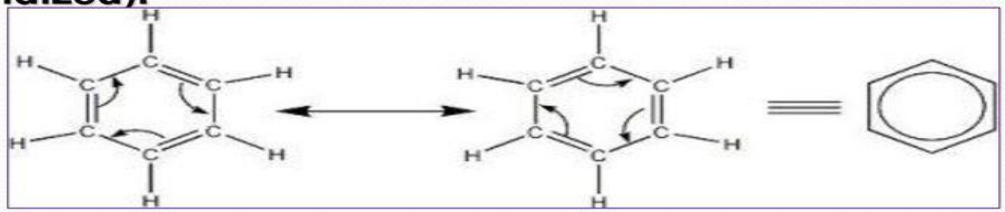
Characteristics of Aromatic Compounds

- **Aromatic compounds** are compounds that resemble benzene in chemical behavior thus **they tend to react by substitution** rather than by addition and fulfill the aromaticity requirements.

To be classified as aromatic, a compound must have :

1) Cyclic structure.
2) Coplanar structure.
3) π electron cloud delocalized all over the ring

Each atom of the ring must have a p orbital to form a delocalized π system i.e. no atoms in the ring can be sp^3 hybridized instead all atoms must be sp^2 hybridized (N.B. carbocation and carbanions are sp^2 hybridized).



4) Fulfill Huckel rule i.e. the system must have 4n + 2 pi electrons : thus by calculating n value it will be an integral number i.e. n=0, 1, 2, 3,

CHARACTERISTICS OF AROMATIC COMPOUNDS

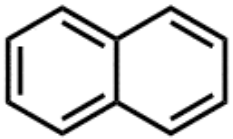
Aromatic compounds are chemical compounds that consist of conjugated planar ring systems accompanied by delocalized pi-electron clouds in place of individual alternating double and single bonds.

Aromatic Compounds Examples

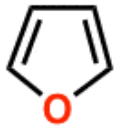
Aromatic hydrocarbon, are hydrocarbons containing sigma bonds and delocalized pi electrons between carbon atoms in a ring. For example, benzene. They are known as aromatic due to their pleasant smell.

CHARACTERISTICS OF AROMATIC COMPOUNDS

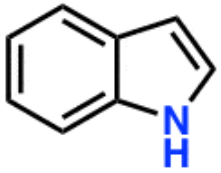
Some examples of aromatic compounds



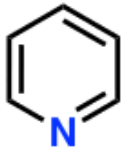
Naphthalene



Furan



Indole

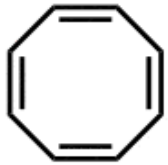


Pyridine

Tropylium ion

Cyclopentadienyl anion

Counter-example



Cyclooctatetraene (*not* aromatic)

CHARACTERISTICS OF AROMATIC COMPOUNDS

Aromatic compounds are broadly divided into two categories: benzenoids (one containing benzene ring) and non-benzenoids (those not containing a benzene ring) for example, furan. Any hydrocarbon can be classified as an aromatic compound provided they follow the Huckel rule. According to Huckel rule, for a ring to be aromatic it should have the following properties:

Planarity

Complete delocalization of the π electrons in the ring

Presence of (4n + 2) π electrons in the ring where n is an integer (n = 0, 1, 2, . . .)

CHARACTERISTICS OF AROMATIC COMPOUNDS

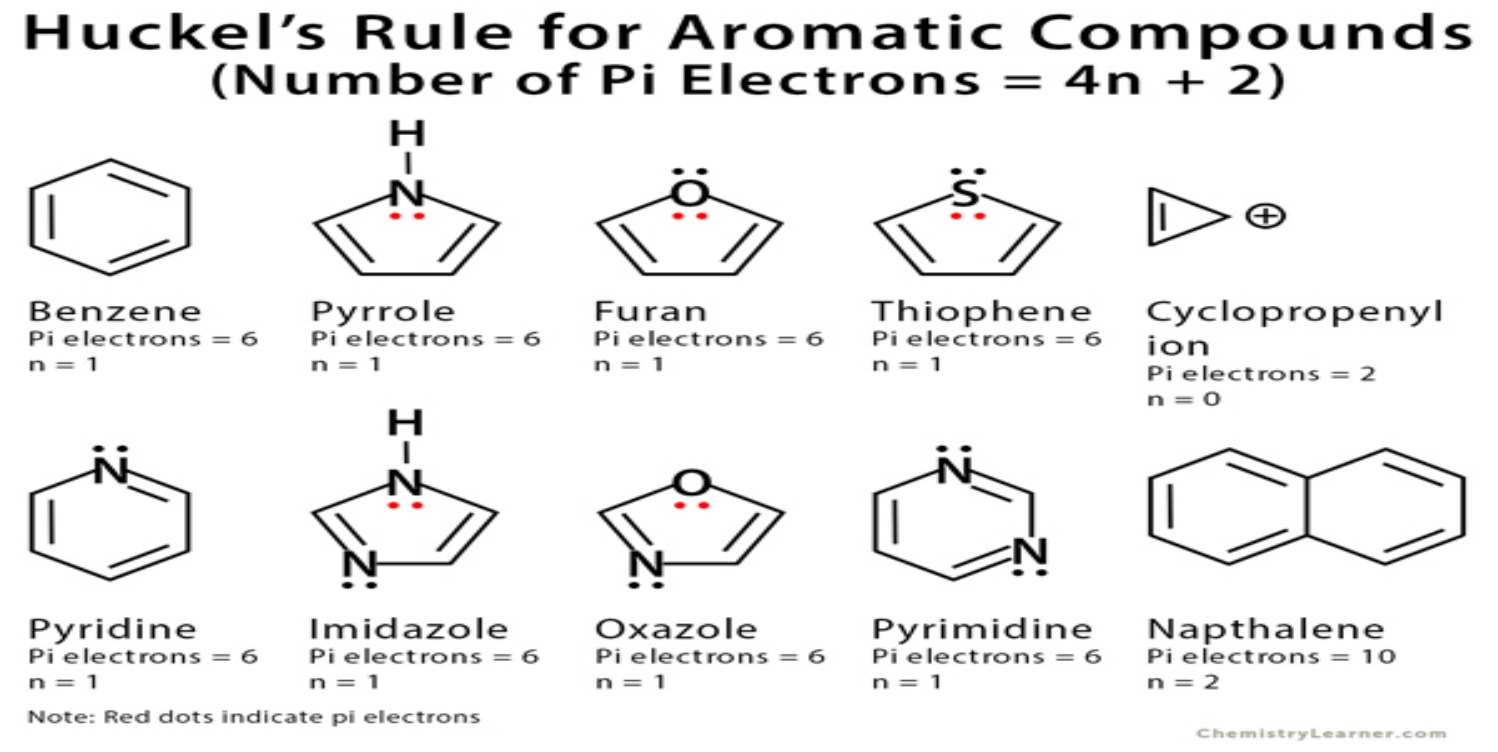
Huckel's Rule of Aromaticity

Huckel's rule states that only planar, fully conjugated monocyclic polyenes having

4n + 2 π electrons, where n is an integer, that is, n = 0, 1, 2, 3, 4, etc., should possess aromatic stability. An aromatic compound must be planar and contain a cyclic cloud of π electrons below and above the plane of the molecule. It contains SP^2 hybridized carbon atoms and must obey the Huckel rule.

According to this rule, the ring system must have (4n+2) π electrons, where n is any whole number (0, 1, 2, 3, etc). On this basis the ring systems which have 2(n=0), 6(n=1), 10(n=2), 14(n=3) etc pi electrons are aromatic. Typical examples of aromatic compounds are benzene, naphthalene, and anthracene.

CHARACTERISTICS OF AROMATIC COMPOUNDS



THANK YOU