

Aromatic Hydrocarbons

3

- Originally called **aromatic** due to fragrant odors, although this definition seems inaccurate as many products possess distinctly non-fragrant smells!
- Currently a compound is said to be aromatic if it has **benzene-like in its properties**.



- Their properties differ markedly from those of aliphatic hydrocarbons.

Aromatic hydrocarbons undergo electrophilic substitution whereas **aliphatic hydrocarbons** undergo electrophilic addition to double and triple bonds and free radical substitution.

The Structure of Benzene Ring

4

- **Benzene** is the **parent hydrocarbon of aromatic compounds**, because of their special chemical properties.
- Today a compound is said to be **aromatic** if it is **benzene-like in its properties**.

Structure of Benzene

- Molecular formula = C_6H_6

The carbon-to-hydrogen ratio in benzene, suggests a **highly unsaturated structure**.

- Benzene reacts mainly by **substitution**.

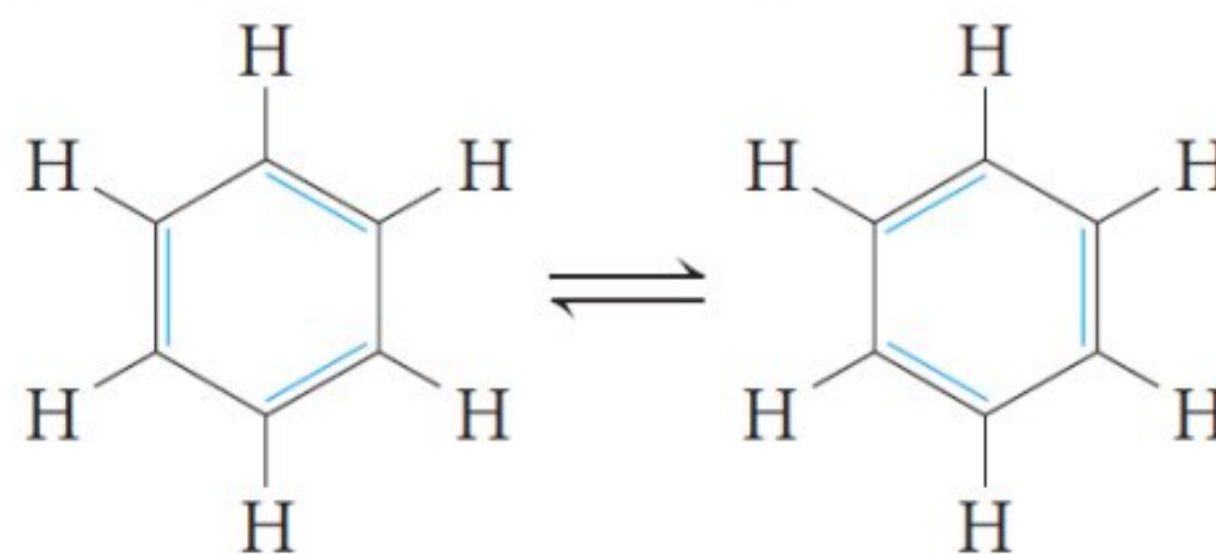
It does not undergo the typical addition reactions of alkenes or alkynes.

The Structure of Benzene Ring

5

○ Kekulé structure for benzene.

- He suggested that six carbon atoms are located at the corners of **a regular hexagon**, with one hydrogen atom attached to each carbon atom.
- He suggested that **single and double bonds alternate** around the ring (conjugated system of double bonds).
- Kekulé suggested that the single and double bonds exchange positions around the ring so rapidly that the typical reactions of alkenes cannot take place.

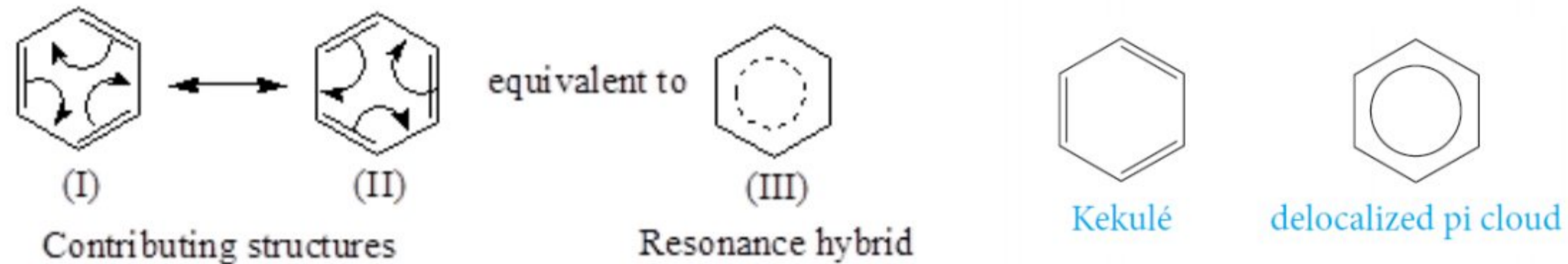


the Kekulé structures for benzene

The Structure of Benzene Ring

6

○ Resonance Model for Benzene.



- Benzene is *planar*.
- All of the *carbon-carbon bond lengths* are identical: 1.39 \AA , intermediate between typical *single* (1.54 \AA) and *double* (1.34 \AA) carbon-carbon bond lengths.
- Each carbon is therefore *sp²-hybridized*.
- Bond angles of 120° .

