SNS COLLEGE OF PHARMACY AND HEALTH SCIENCES

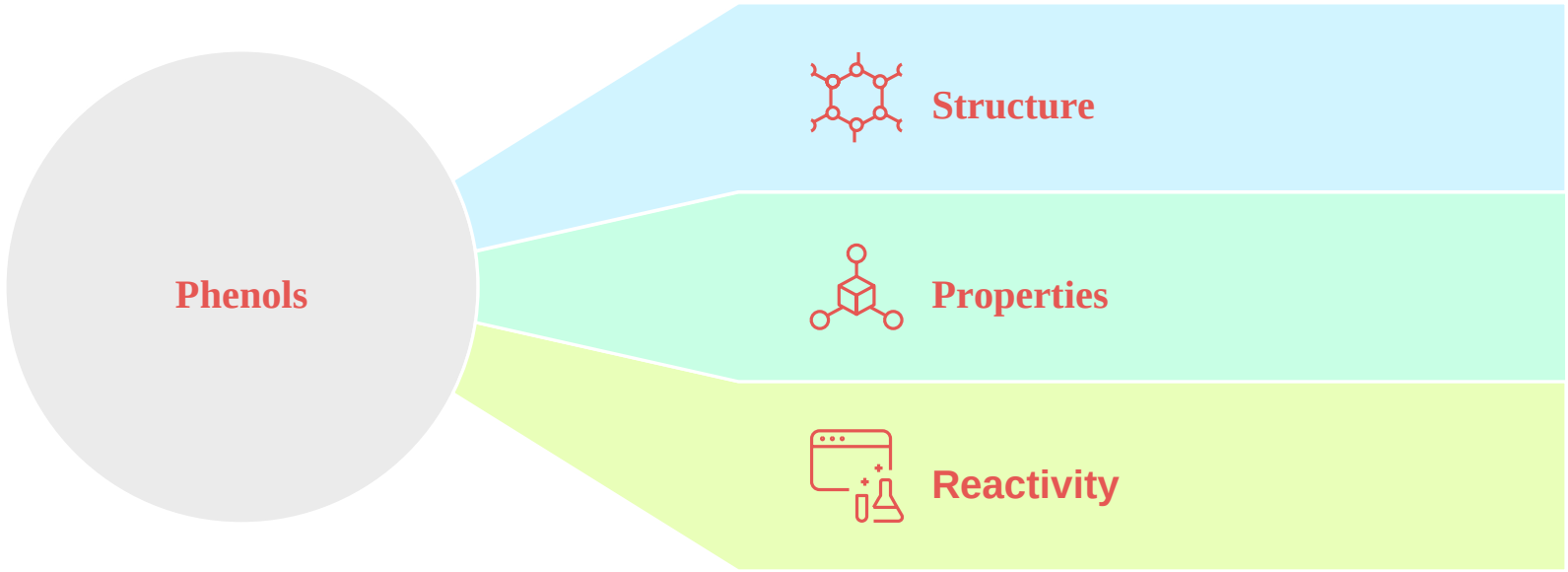
Affiliated To The Tamil Nadu Dr. MGR Medical University, Chennai
Approved by Pharmacy Council of India, New Delhi.
Coimbatore -641035

COURSE NAME : PHARMACEUTICAL ORGANIC CHEMISTRY-II

III SEM / II YEAR

TOPIC 1 : PHENOLS -CHEMISTRY

Exploring the Dimensions of Phenols



DOW'S PROCESS

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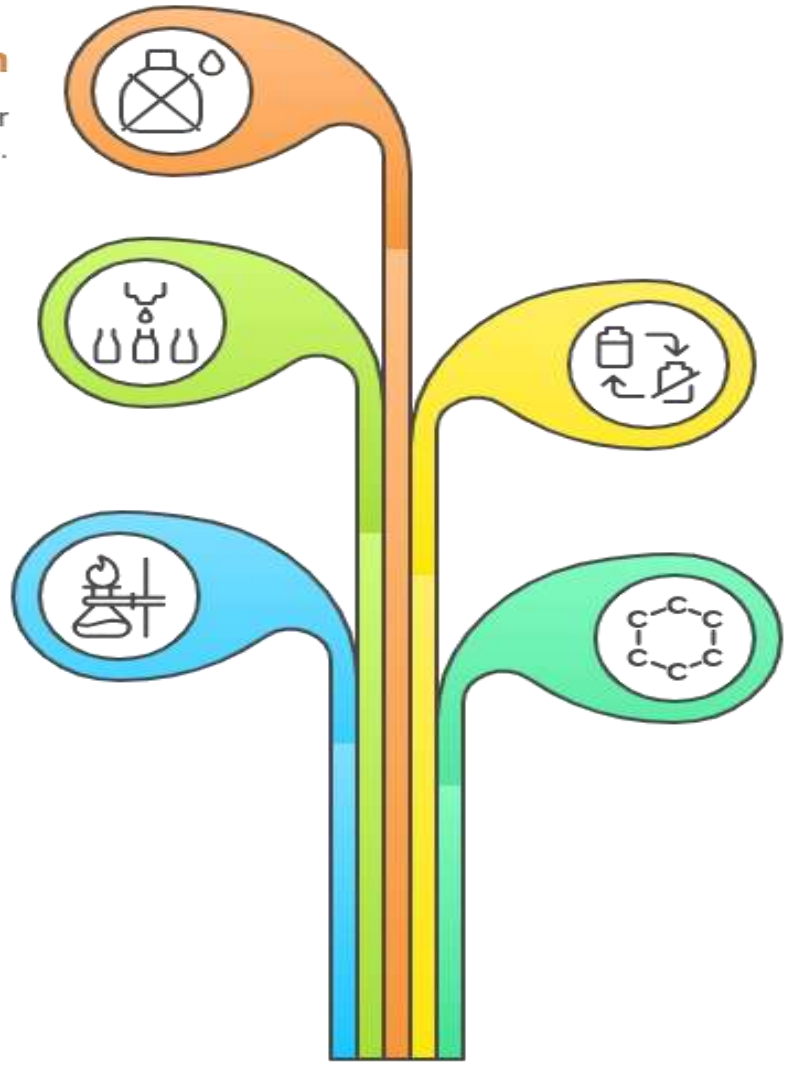


Phenol Purification

Phenol is purified for commercial applications.

Cooling and Distillation

Reaction mixture is cooled and phenol is distilled.

High-Pressure Steam and NaOH

Chlorobenzene reacts with high-pressure steam and NaOH.

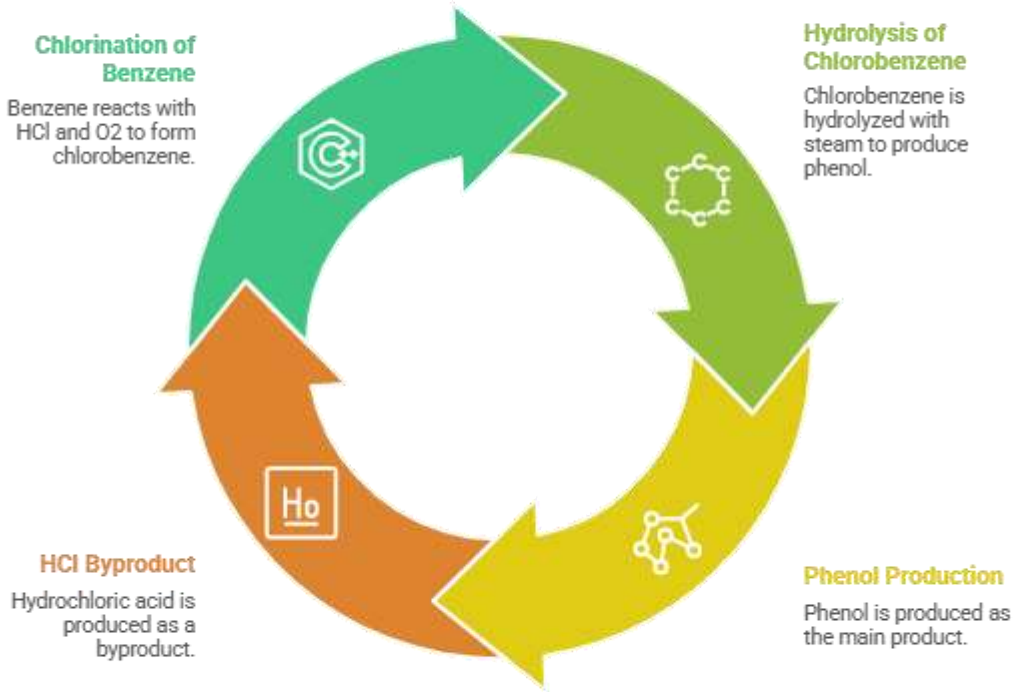
By-Product Separation

By-products are separated from the phenol product.

Phenol and NaCl Formation

Phenol and sodium chloride are formed in the reaction.

Raschig-Hooker Process Cycle



Cumene Process Cycle

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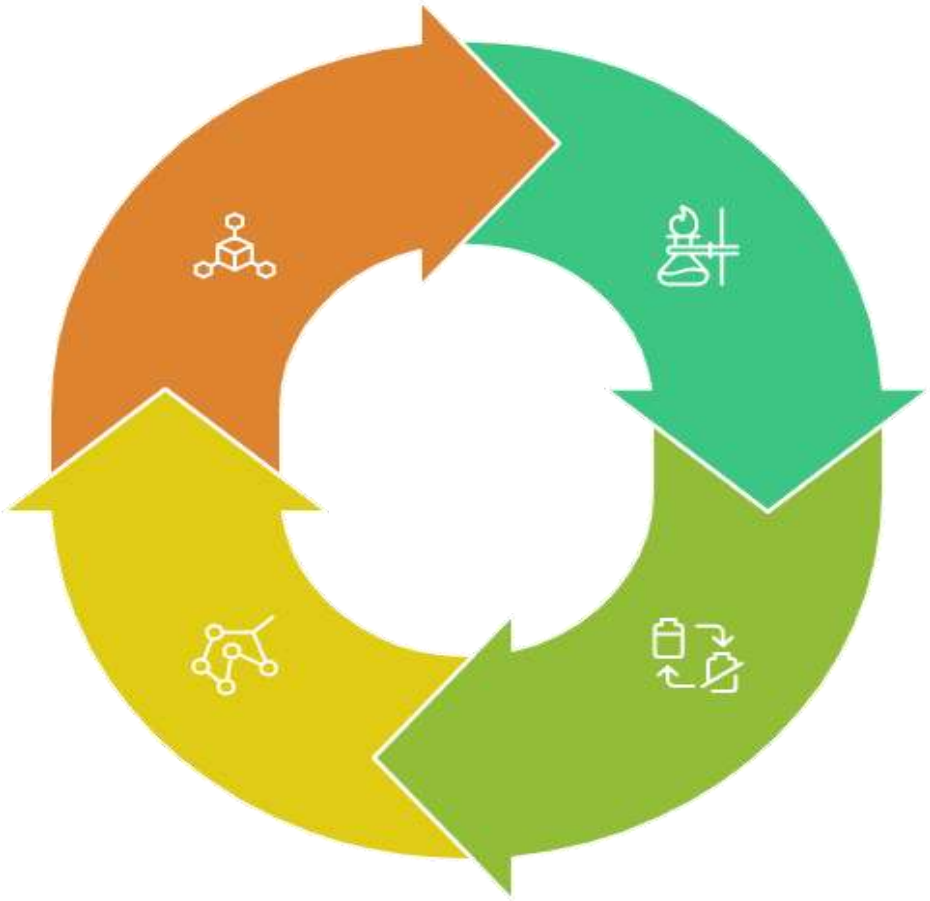
Acetone Production

Acetone is produced as a valuable industrial chemical.



Cumene Oxidation

Cumene is oxidized to form cumene hydroperoxide.

Phenol Production

Phenol is produced as a valuable industrial chemical.

Acid-Catalyzed Cleavage

Cumene hydroperoxide is cleaved into phenol and acetone.

Cumene Process Cycle

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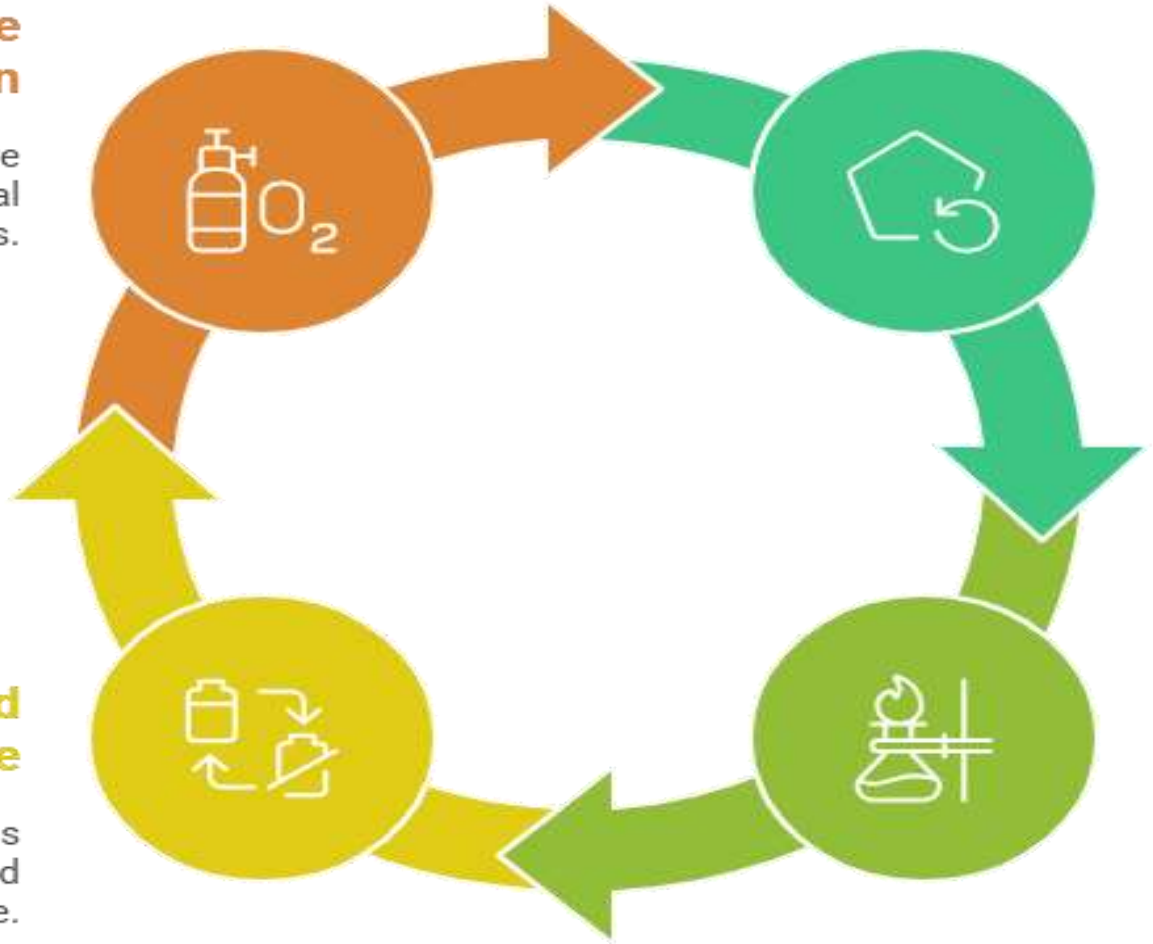
Phenol and Acetone Production

Phenol and acetone are produced as final products.



Alkylation of Benzene

Benzene reacts with propene to form cumene.

Oxidation of Cumene

Cumene is oxidized to form cumene hydroperoxide.

Acid-Catalyzed Cleavage

Cumene hydroperoxide is cleaved into phenol and acetone.

Diazotization Process

Aromatic Amine

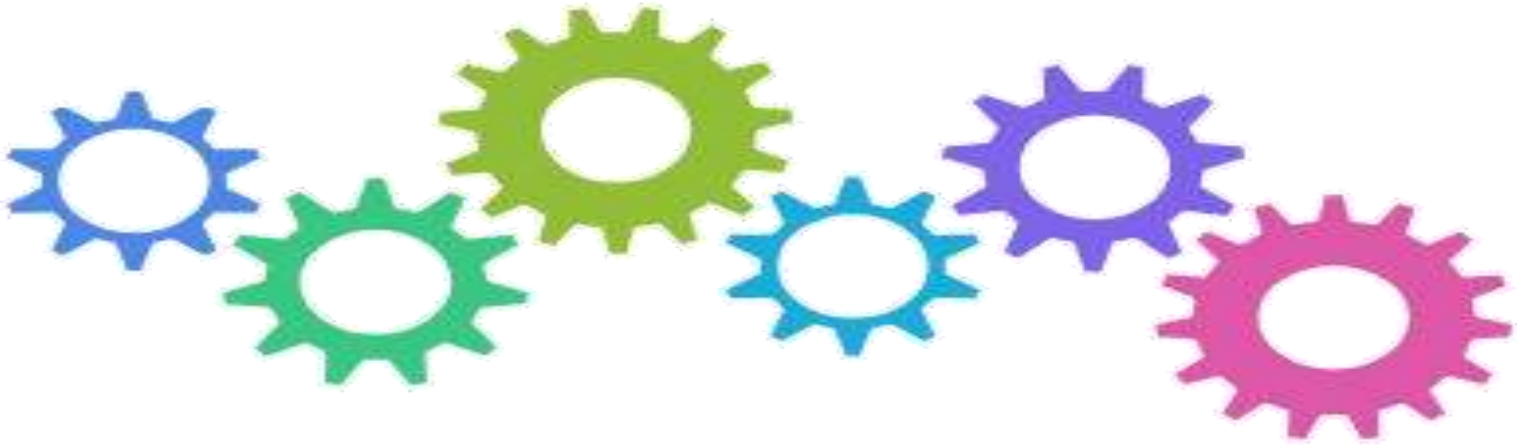
Aniline is the starting aromatic amine.

Sodium Nitrite

$NaNO_2$ is used to produce HNO_2.

Low Temperature

The reaction is conducted at 0-5°C.



Nitrous Acid

HNO_2 is generated in situ.

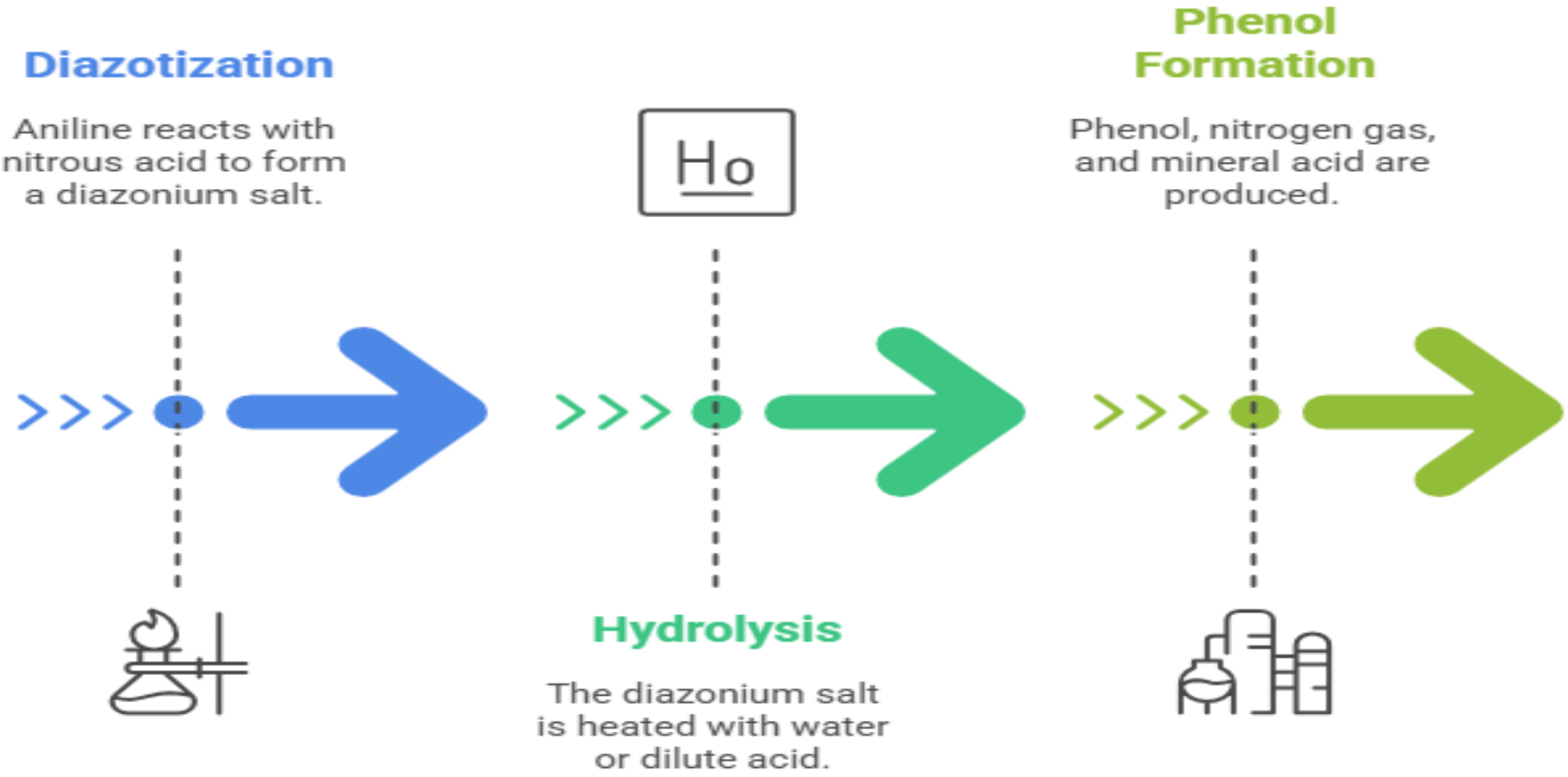
Mineral Acid

HCl or H_2SO_4 is used to produce HNO_2.

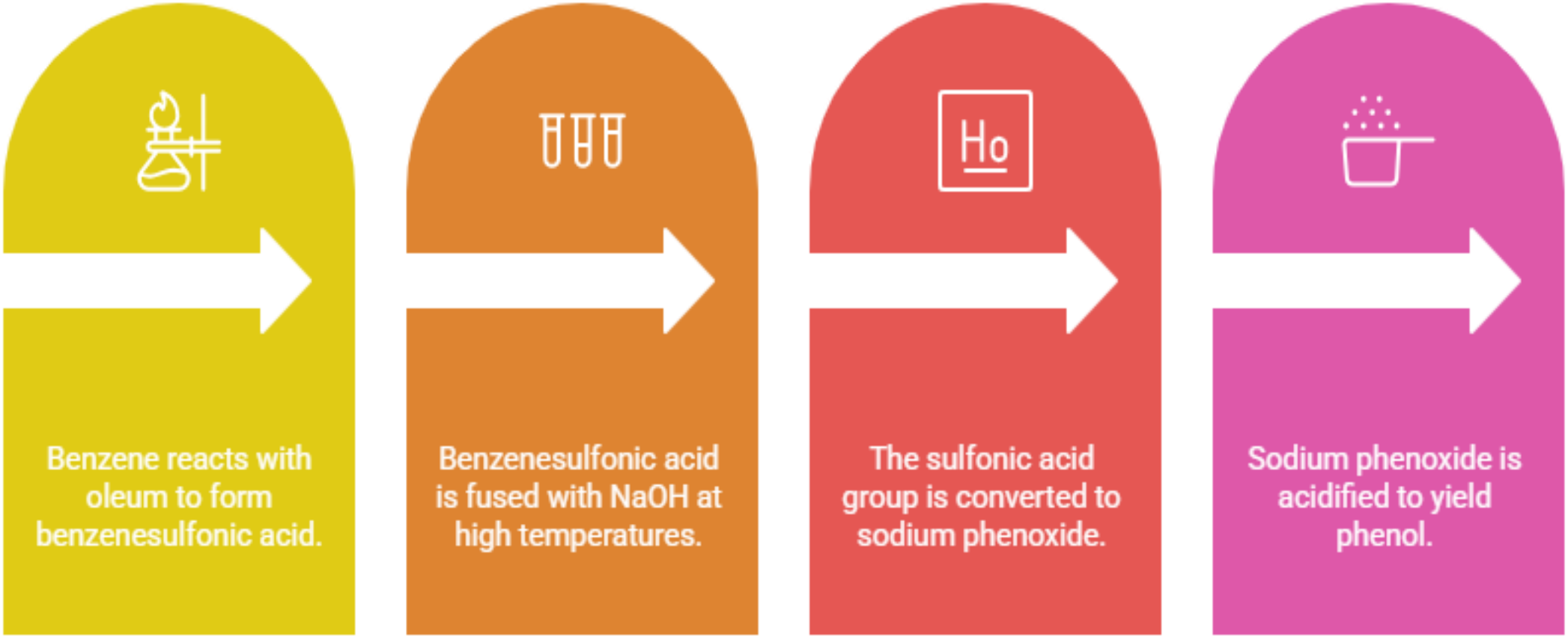
Diazonium Salt

The final product is a diazonium salt.

Phenol Synthesis from Diazonium Salts



Phenol Synthesis from Sulfonic Acids



Grignard Reagent Reaction with Oxygen

Reaction with Oxygen

- Grignard reagents can react with oxygen to form a magnesium phenoxide.
- This reaction highlights the reactivity of Grignard reagents in the presence of atmospheric oxygen, leading to the formation of a stable intermediate.

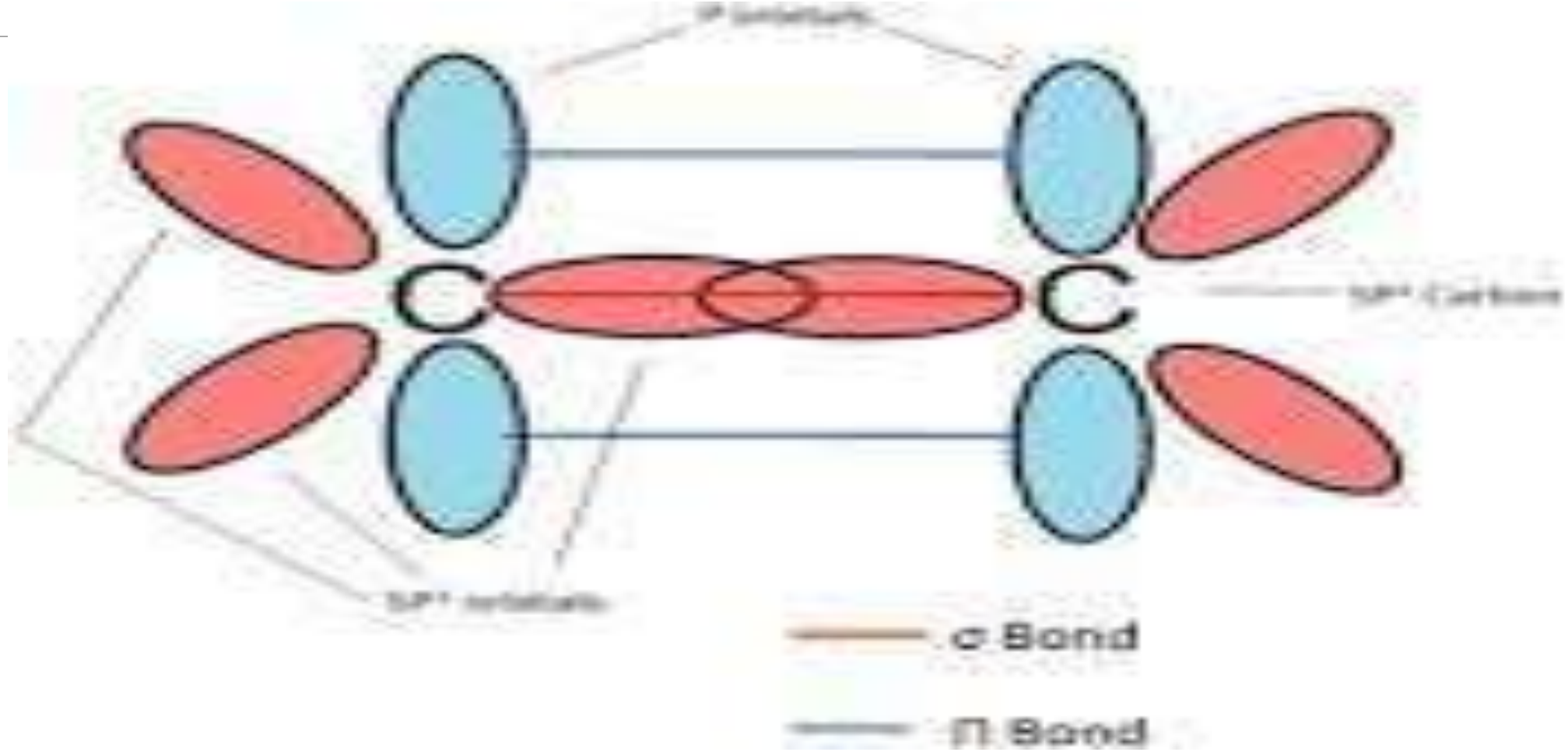
Hydrolysis of Magnesium Phenoxide

- which can then be hydrolyzed to yield a phenol.
- The subsequent hydrolysis step is crucial as it transforms the magnesium phenoxide into a valuable phenolic compound, showcasing the versatility of Grignard reagents in organic synthesis.

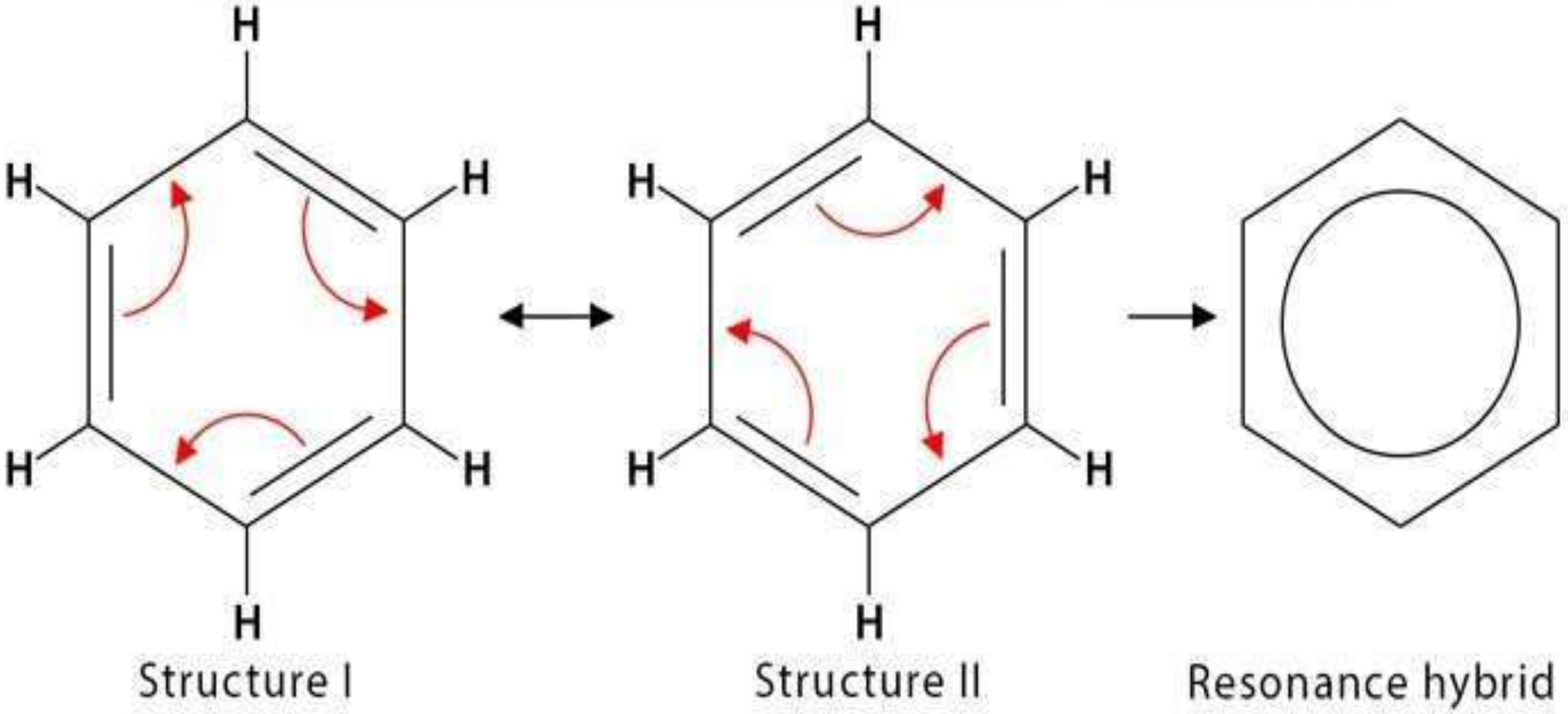
Magnesium Phenoxide Hydrolysis

- The magnesium phenoxide that is produced undergoes hydrolysis with dilute acid
- resulting in the formation of phenol

FORMATION OF THE Π SYSTEM



Delocalization of Pi Electrons in Benzene



Acidity Enhancement Cycle in Phenols

Acidity Increase

The phenol's acidity increases.

Ion Stabilization

The phenoxide ion becomes more stable.

EWG Attachment

Electron-withdrawing groups attach to the phenol ring.

Charge Delocalization

EWGs delocalize the negative charge in the phenoxide ion.

Impact of Electron-Donating Groups on Phenol Acidity

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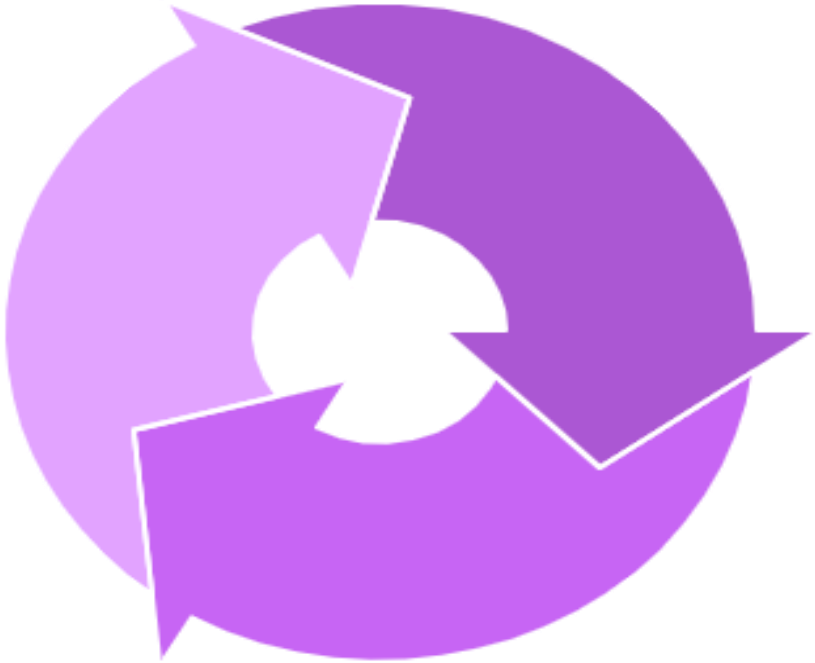
Acidity Decreases

Destabilization leads to lower acidity.



EDGs Increase Electron Density

EDGs add electrons to the aromatic ring.

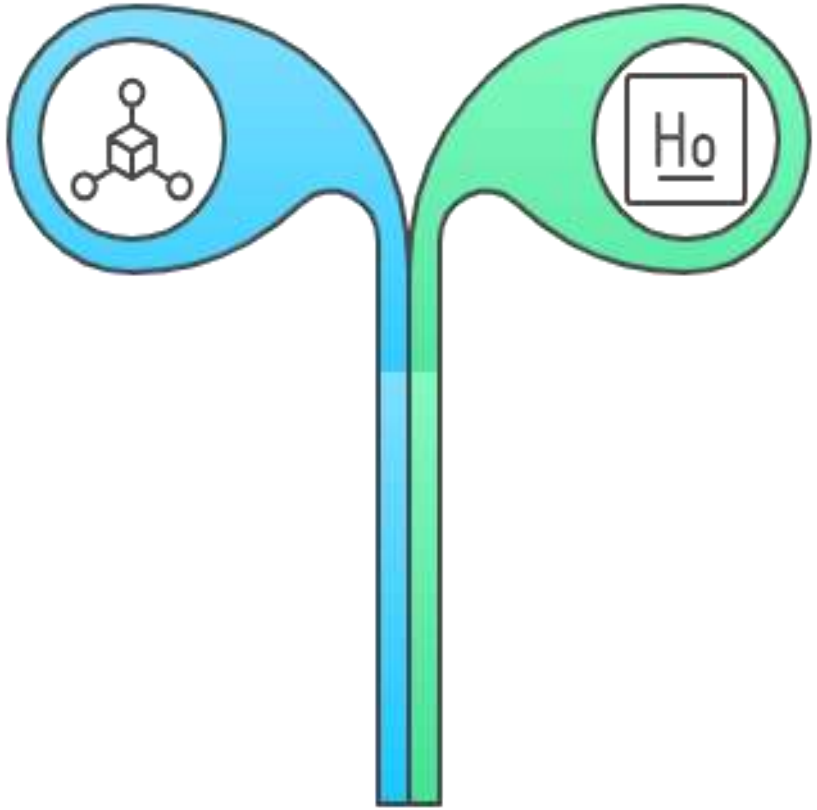
Phenoxide Ion Destabilization

Increased electron density destabilizes the phenoxide ion.

Unveiling the Impact of Solvent Effects on Phenol Acidity

Polar Solvents

Polar solvents stabilize phenoxide ion, increasing acidity.

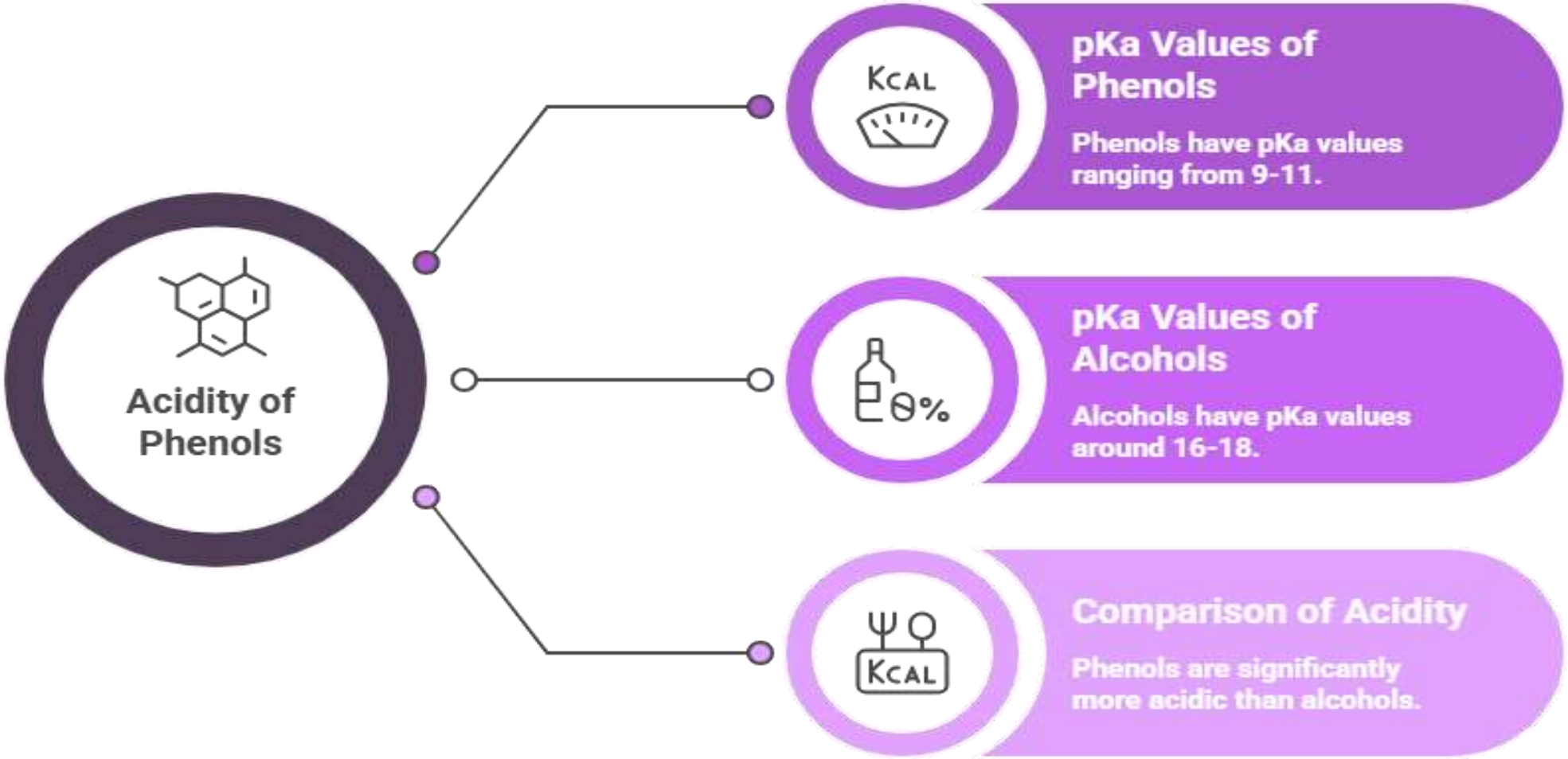


Hydrogen Bonding

Hydrogen bonding enhances solvation, boosting phenol acidity.

Made with Napkin

Unveiling Phenol Acidity Through pKa Values



Phenol's Industrial Significance

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Resins

Employed in adhesives and coatings

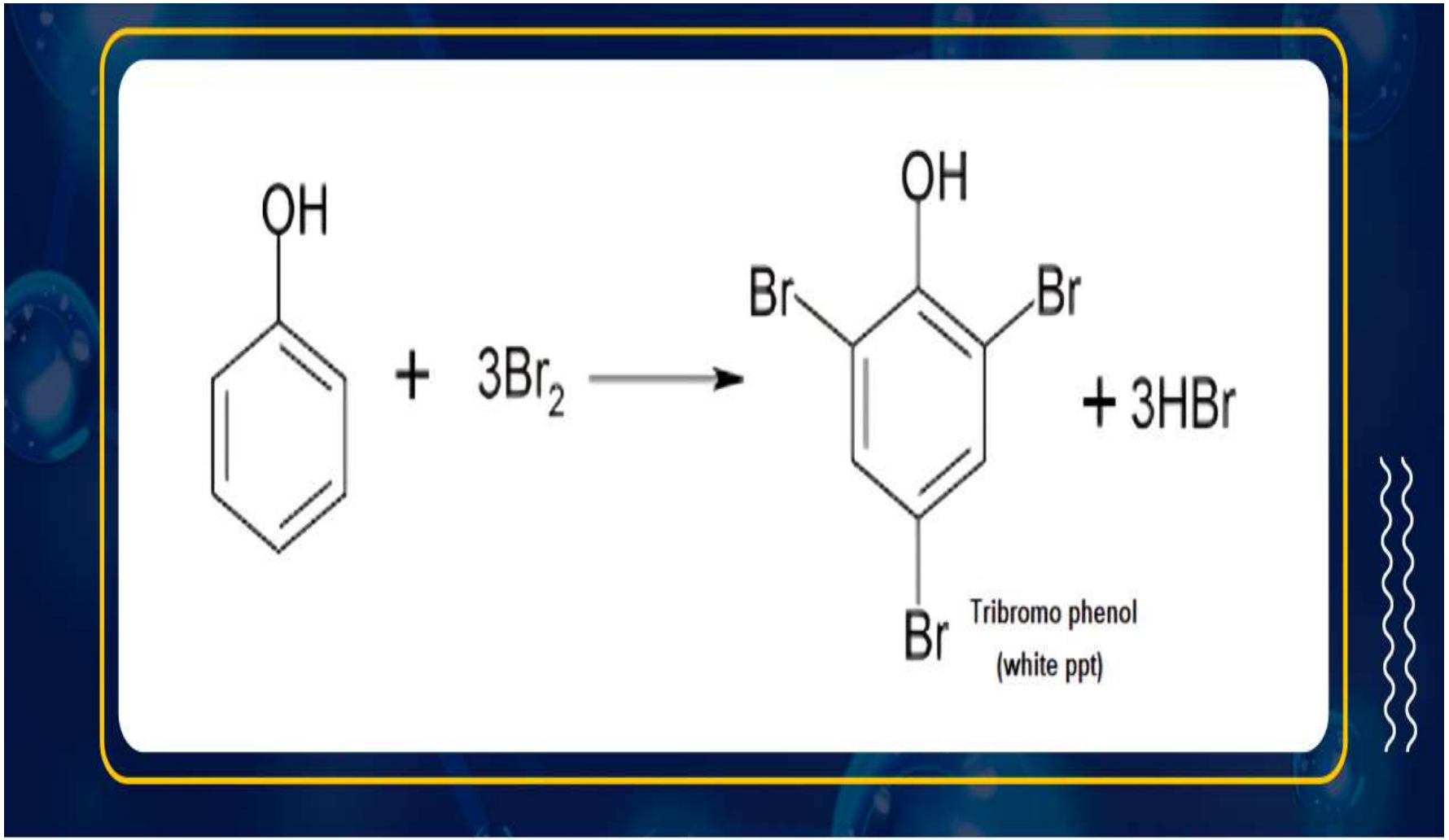
Chemical Products

Essential for various industrial applications

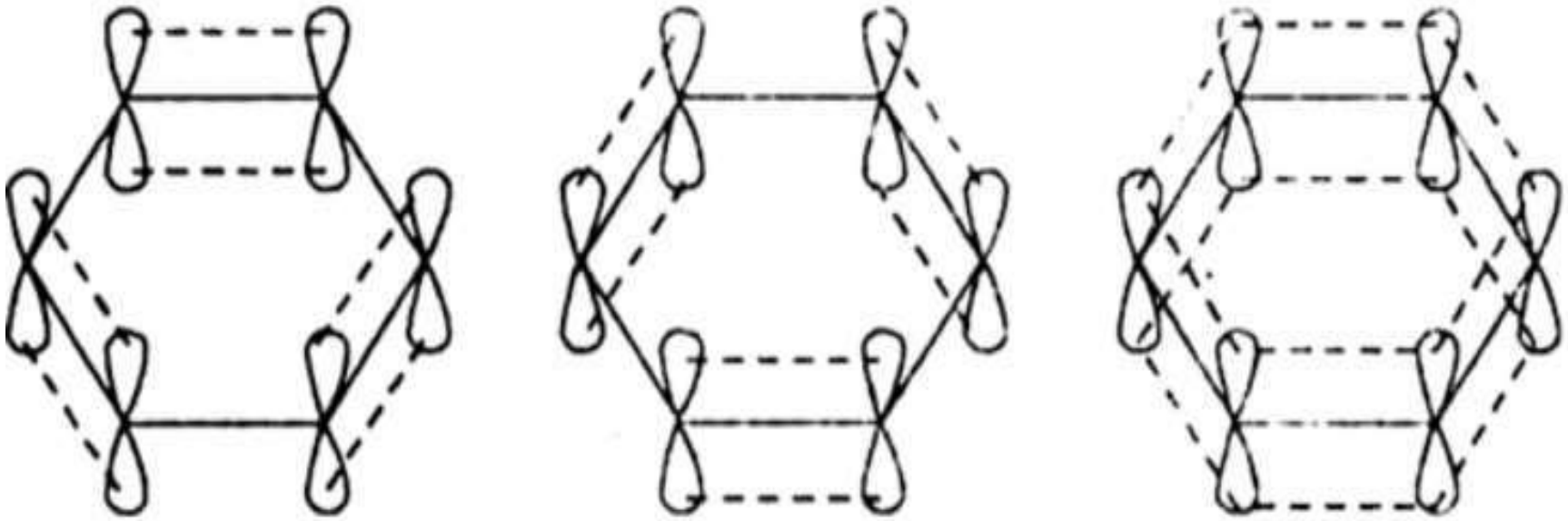
Polymers

Used in plastics and synthetic materials

ASSESMENTS



Explain the molecular orbital picture of Benzene




Thank You