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.

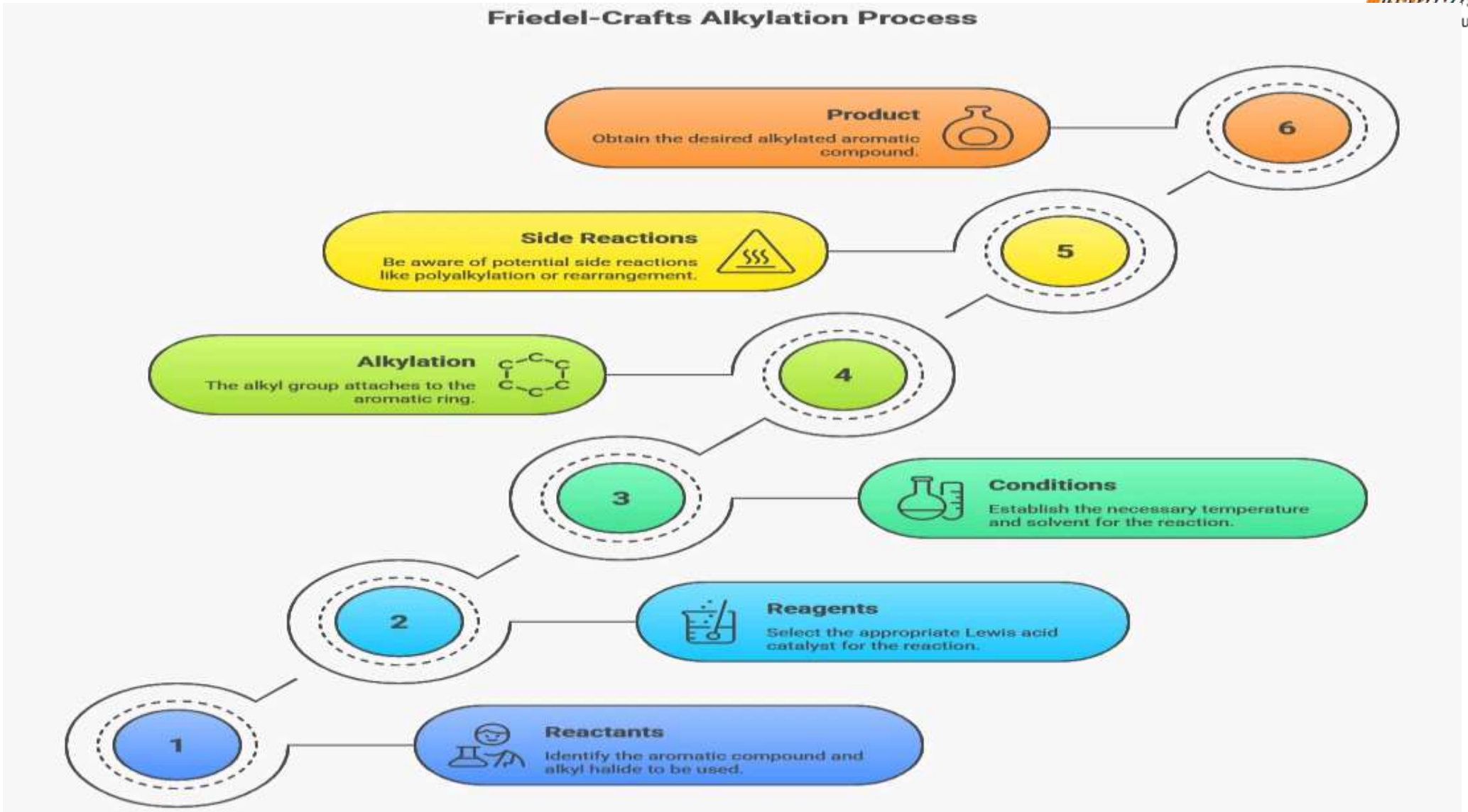
Coimbatore -641035

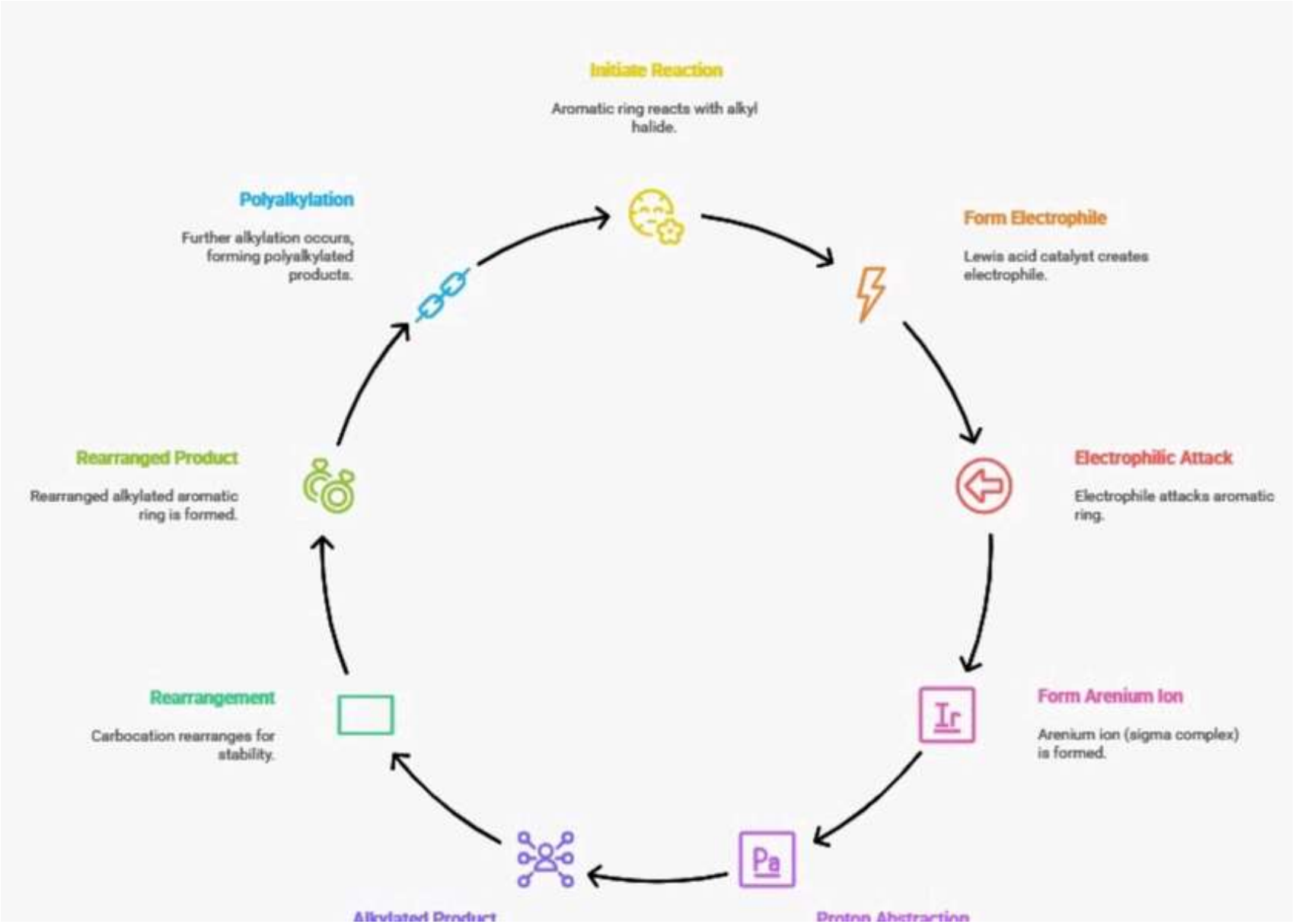
COURSE NAME : PHARMACEUTICAL ORGANIC CHEMISTRY-2(BP 706 T)

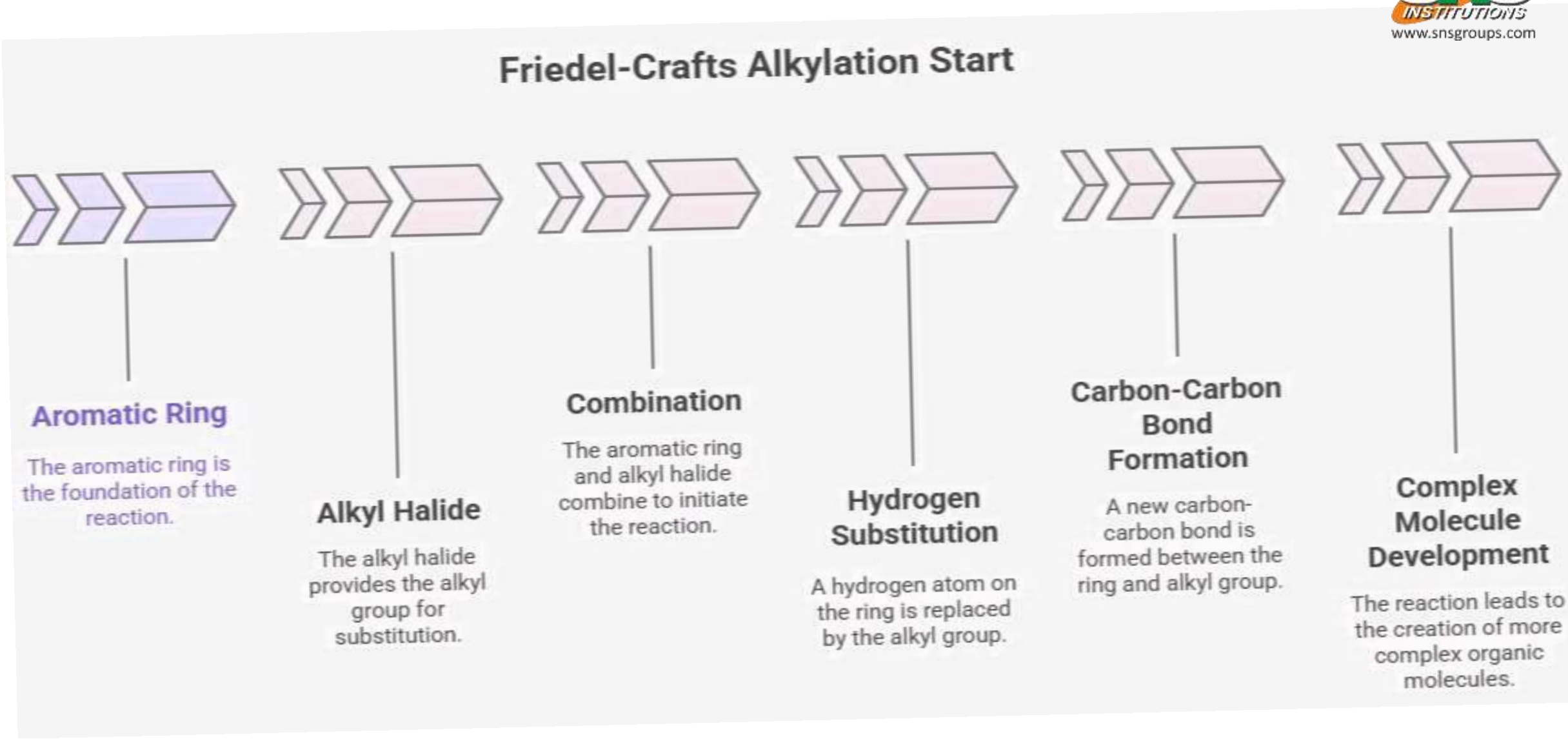
B.PHARM III SEM / II YEAR

TOPIC : FRIEDELCRAFT'S REACTIONS OF BENZENE

FRIEDEL CRAFTS ALKYLATION PROCESS

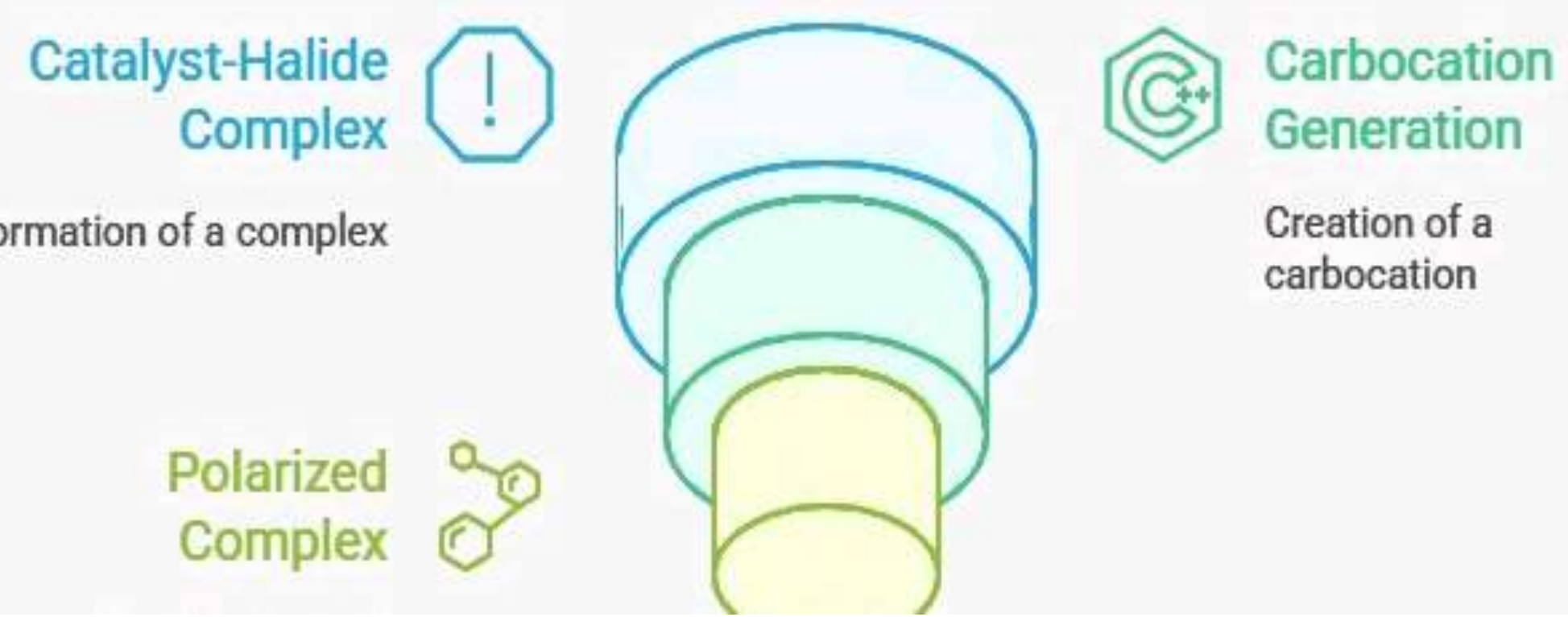



Initiate Reaction
Aromatic ring reacts with alkyl halide.
Form Electrophile
Lewis acid catalyst creates electrophile.
Electrophilic Attack
Electrophile attacks aromatic ring.
Form Arenium Ion
Arenium ion (sigma complex) is formed.
Ir
Proton Abstraction
Pa
Alkylated Product
Rearrangement
Carbocation rearranges for stability.
Rearranged Product
Rearranged alkylated aromatic ring is formed.
Polyalkylation
Further alkylation occurs, forming polyalkylated products.

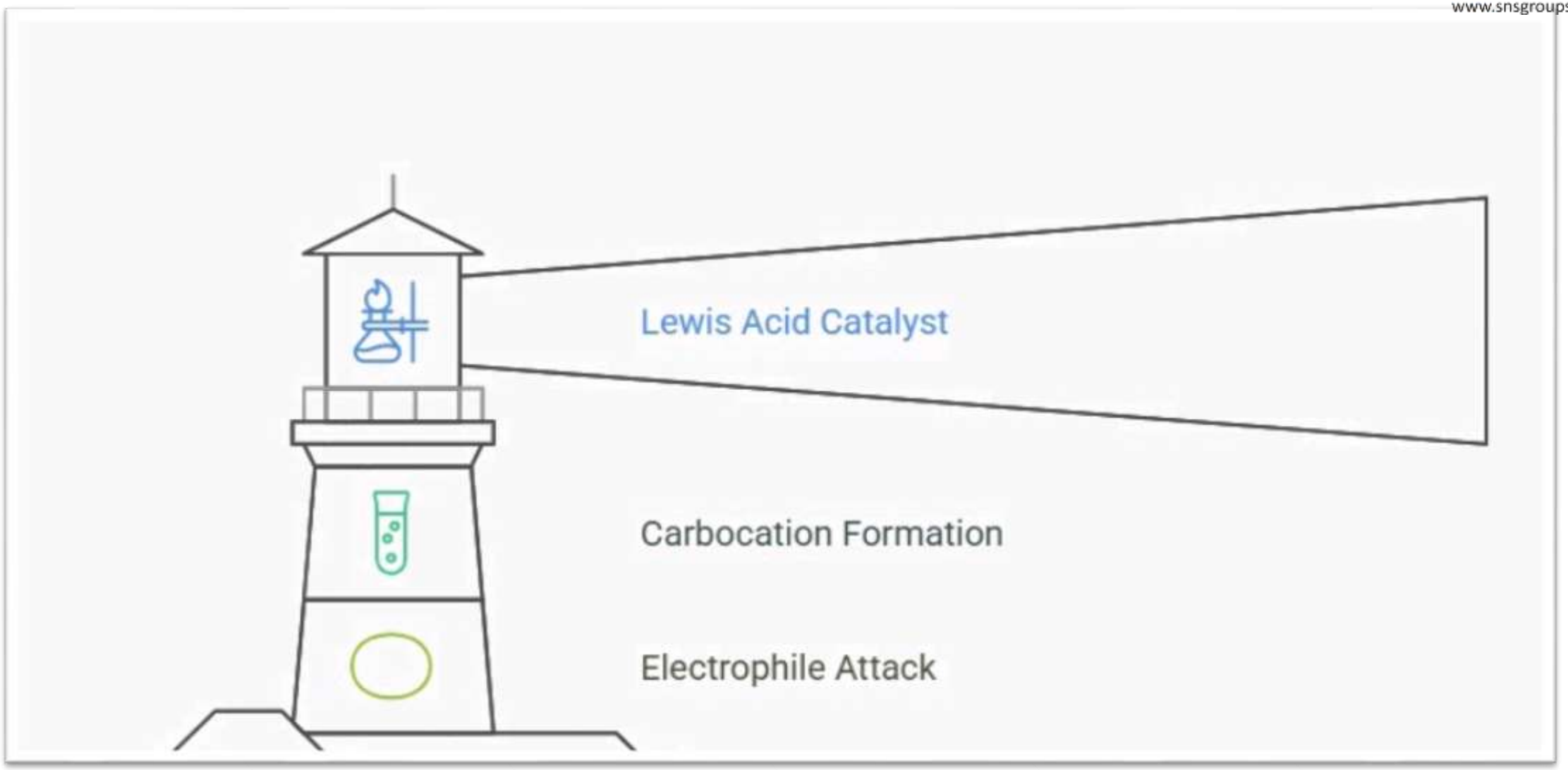

Friedel-Crafts Alkylation Start
Aromatic Ring
The aromatic ring is the foundation of the reaction.
Alkyl Halide
The alkyl halide provides the alkyl group for substitution.
Combination
The aromatic ring and alkyl halide combine to initiate the reaction.
Hydrogen Substitution
A hydrogen atom on the ring is replaced by the alkyl group.
Carbon-Carbon Bond Formation
A new carbon-carbon bond is formed between the ring and alkyl group.
Complex Molecule Development
The reaction leads to the creation of more complex organic molecules.

Activation of Alkyl Halide by Lewis Acid

LEWIS ACID CATALYST



FORMATION OF ELECTROPHILE



Friedel-Crafts Alkylation Process

Catalyst Presence

Check for Lewis acid catalyst

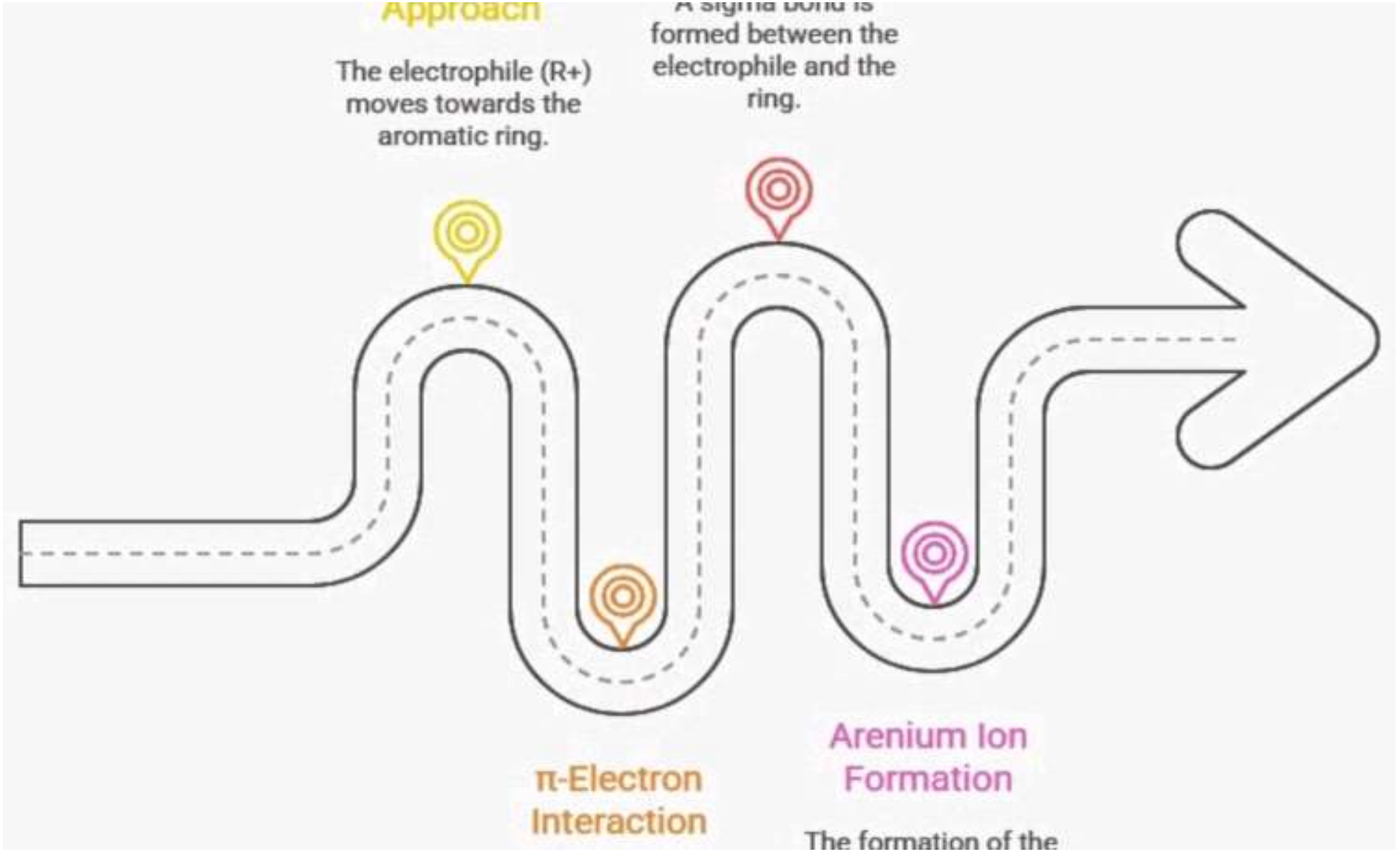
Ring Activation

Assess deactivating groups

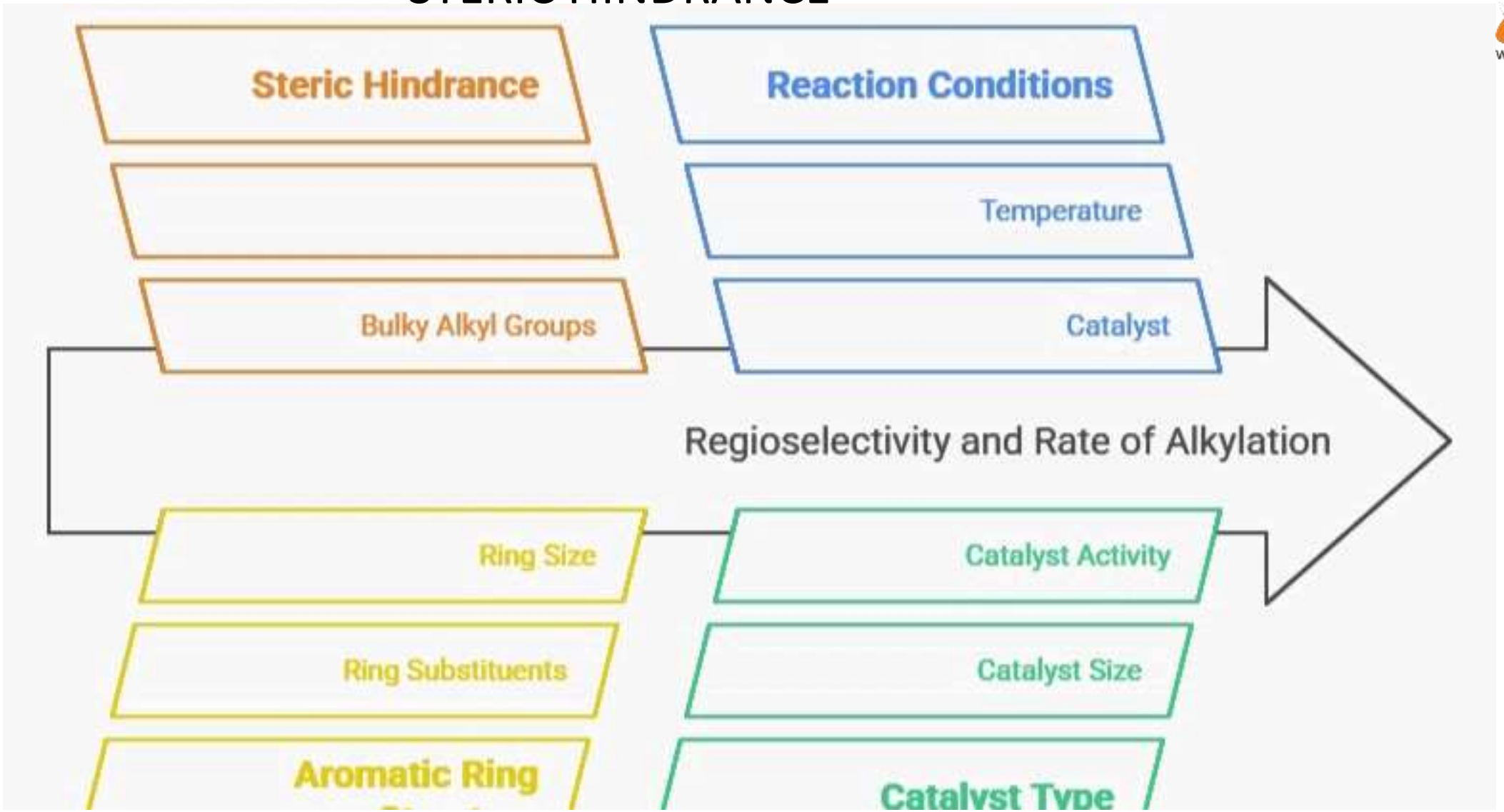
Nucleophilicity

Determine ring's nucleophilicity

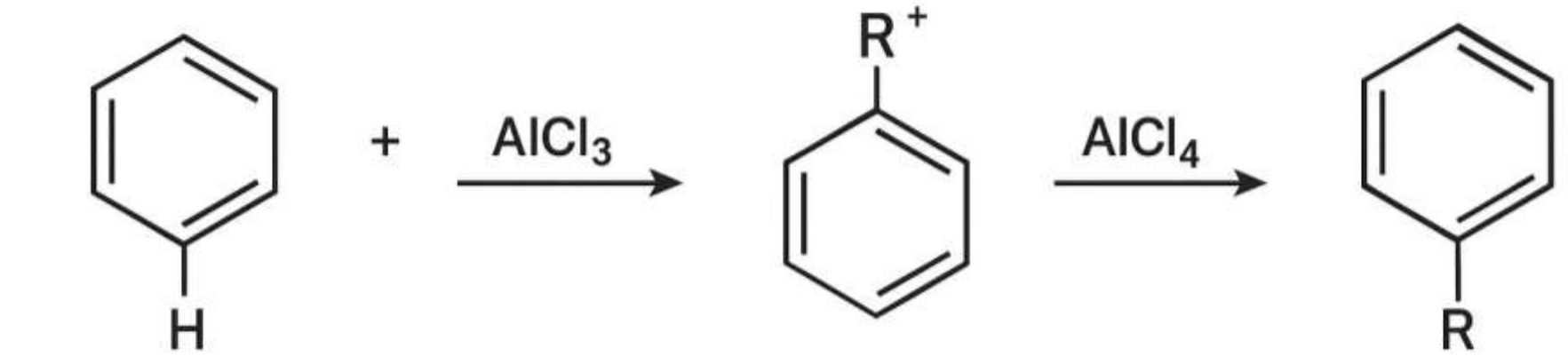
ELECTROPHILIC ATTACK ON AROMATIC RING



STERIC HINDRANCE

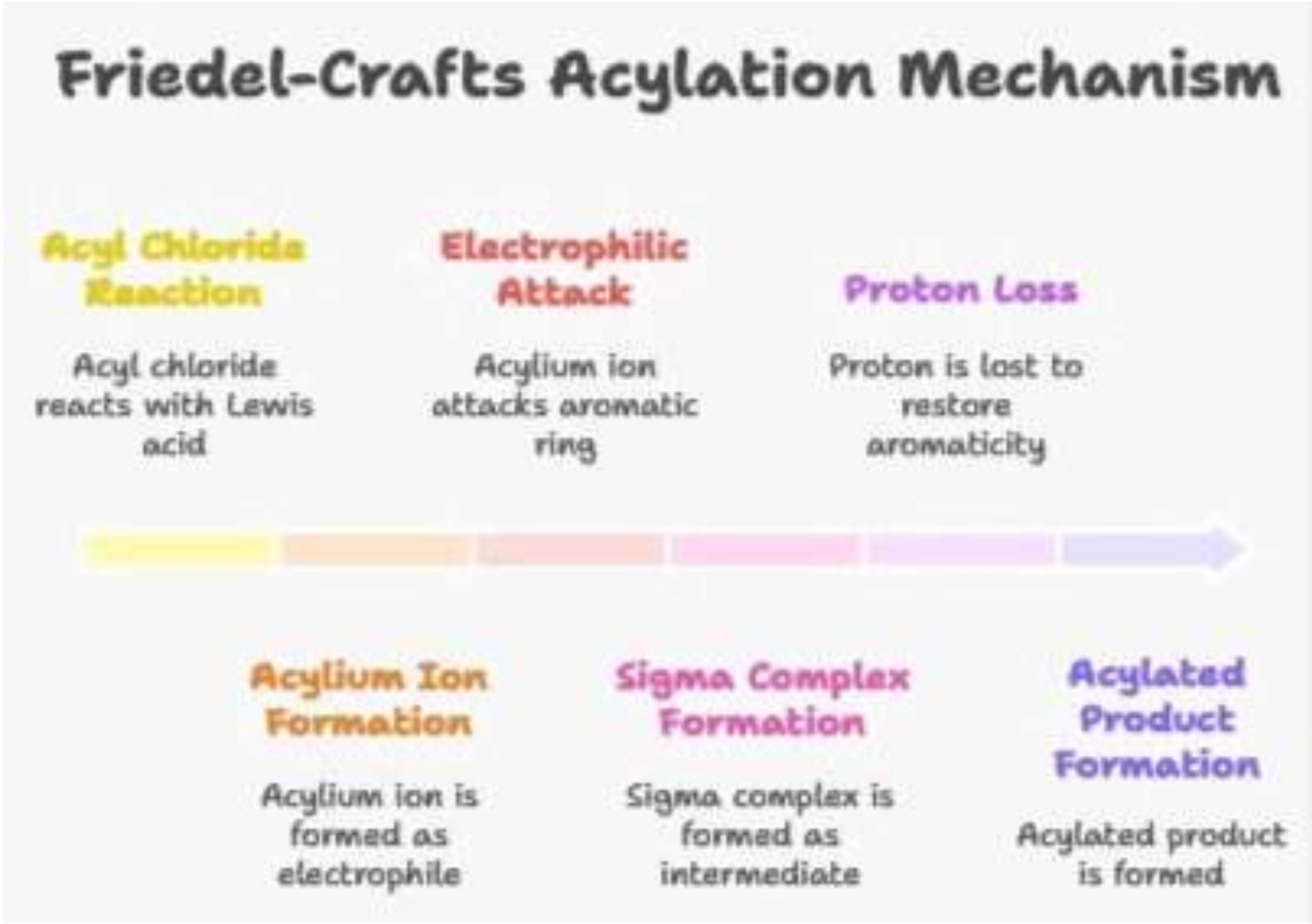


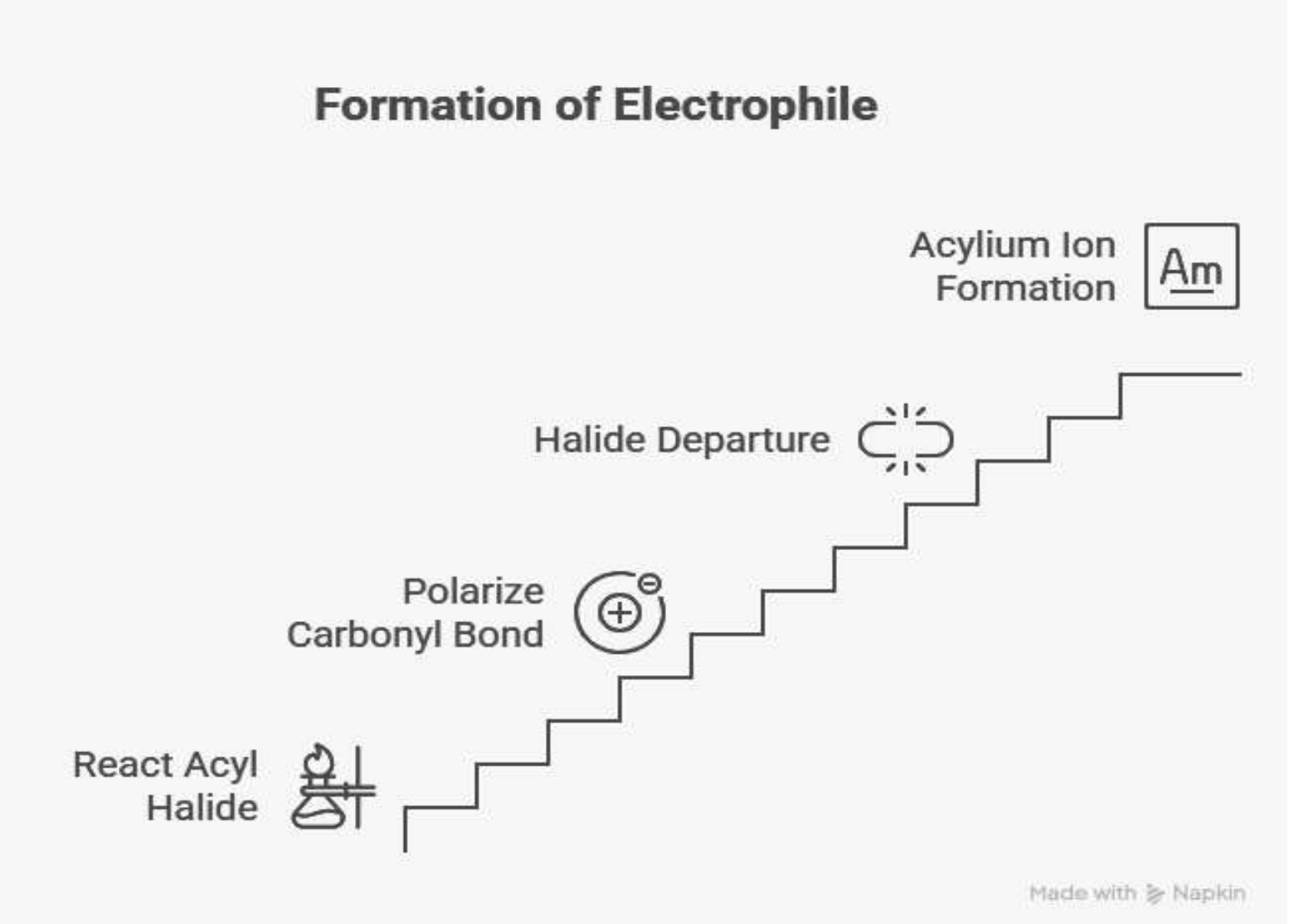
FRIEDEL–CRAFTS ALKYLATION

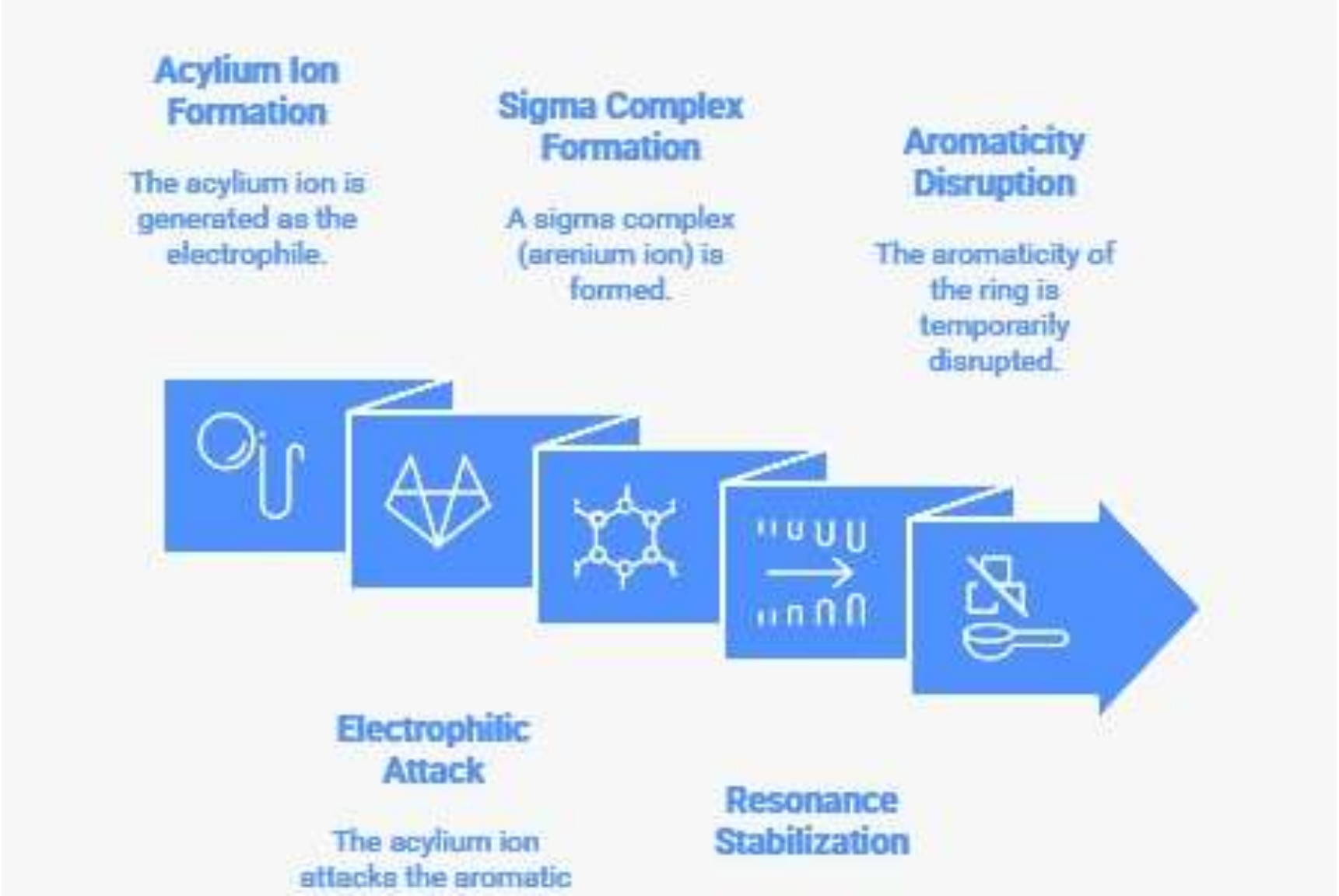


Friedel-Crafts Alkylation

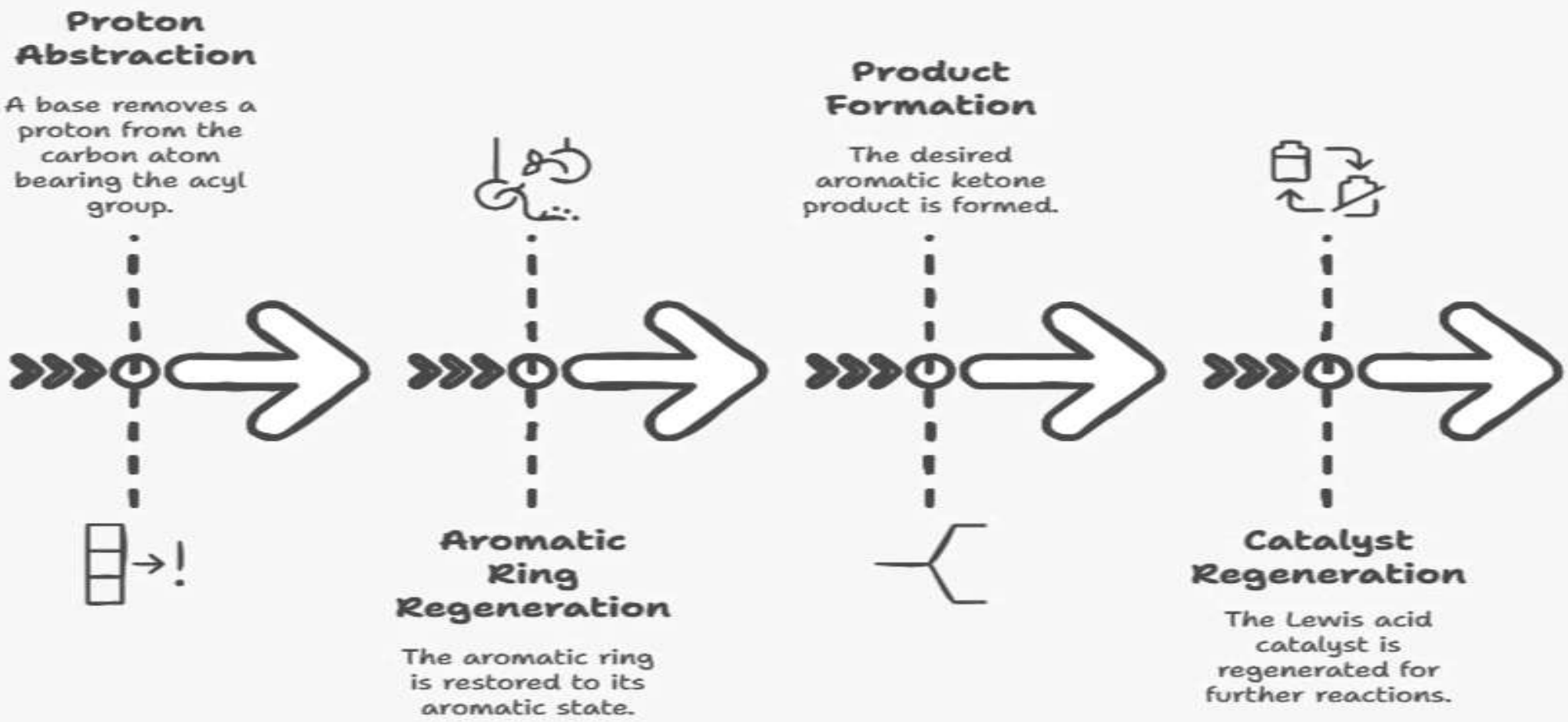
LIMITATIONS

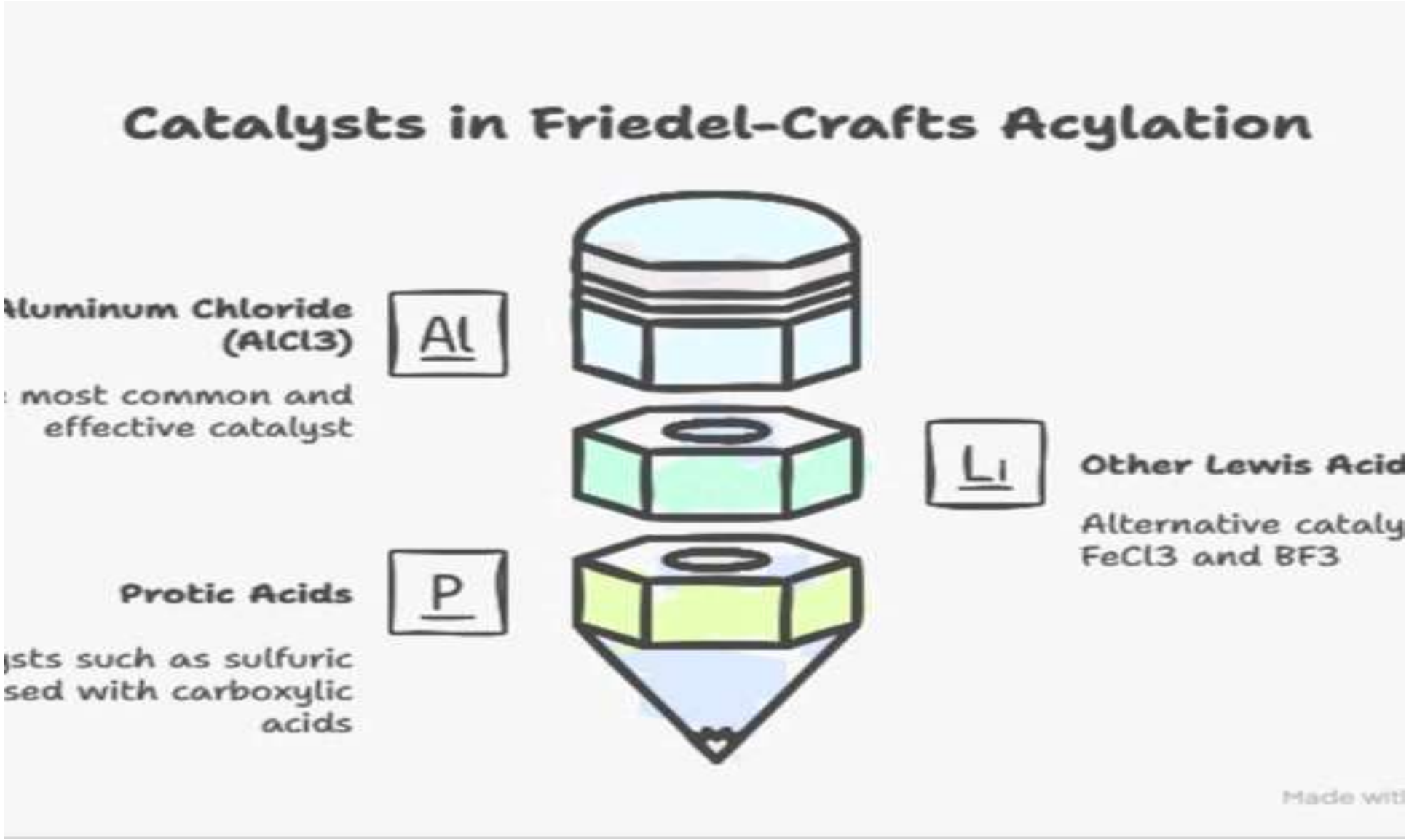

Friedel-Crafts Acylation Mechanism
Acyl Chloride Reaction
Acyl chloride reacts with Lewis acid
Electrophilic Attack
Acylium ion attacks aromatic ring
Proton Loss
Proton is lost to restore aromaticity
Acylium Ion Formation
Acylium ion is formed as electrophile
Sigma Complex Formation
Sigma complex is formed as intermediate
Acylated Product Formation
Acylated product is formed


Formation of Electrophile
Acylium Ion Formation
Am
Halide Departure
Polarize Carbonyl Bond
React Acyl Halide
Made with Napkin


Acylium Ion Formation
The acylium ion is generated as the electrophile.
Sigma Complex Formation
A sigma complex (arenium ion) is formed.
Aromaticity Disruption
The aromaticity of the ring is temporarily disrupted.
Electrophilic Attack
The acylium ion attacks the aromatic
Resonance Stabilization

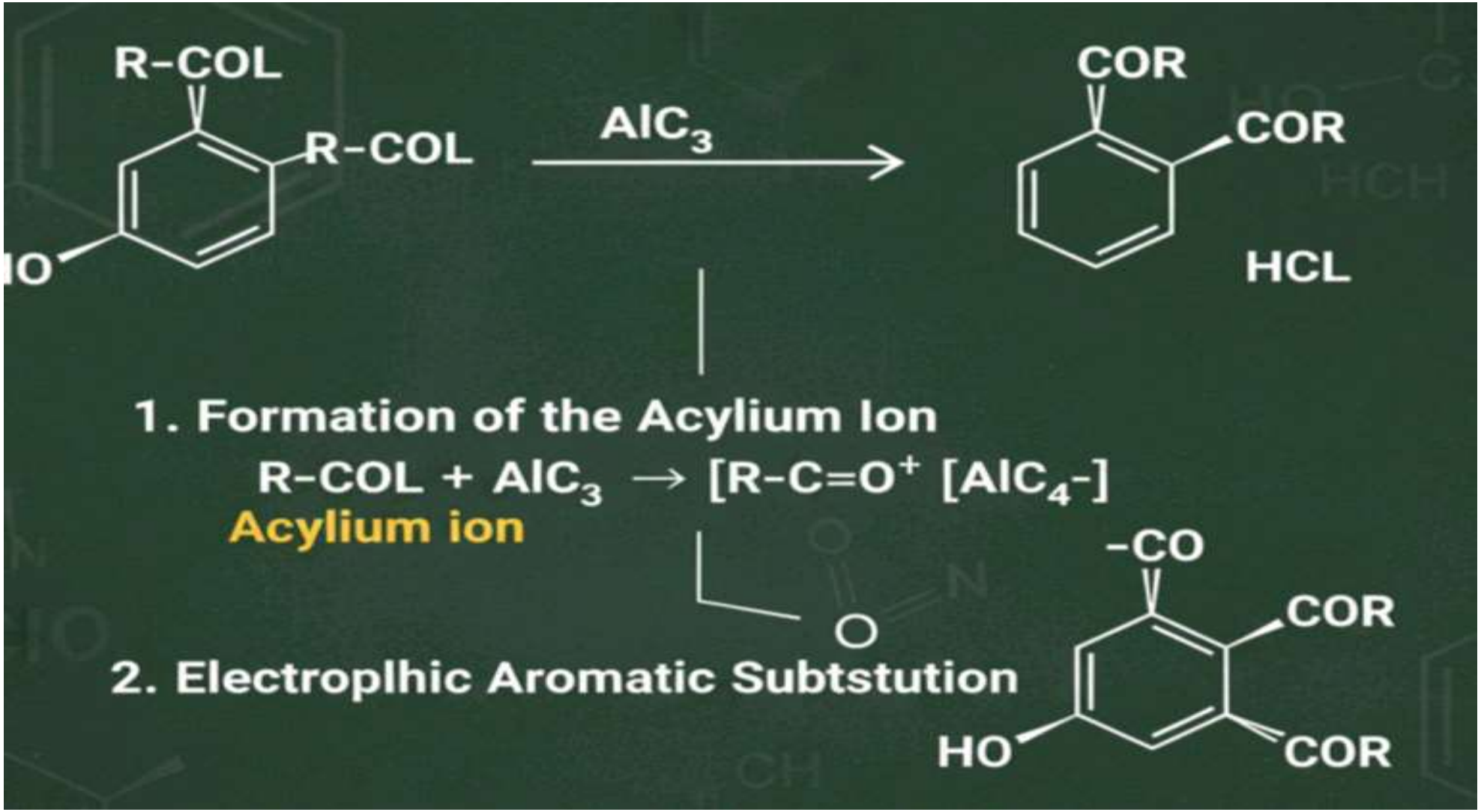
Friedel-Crafts Acylation Reaction Mechanism



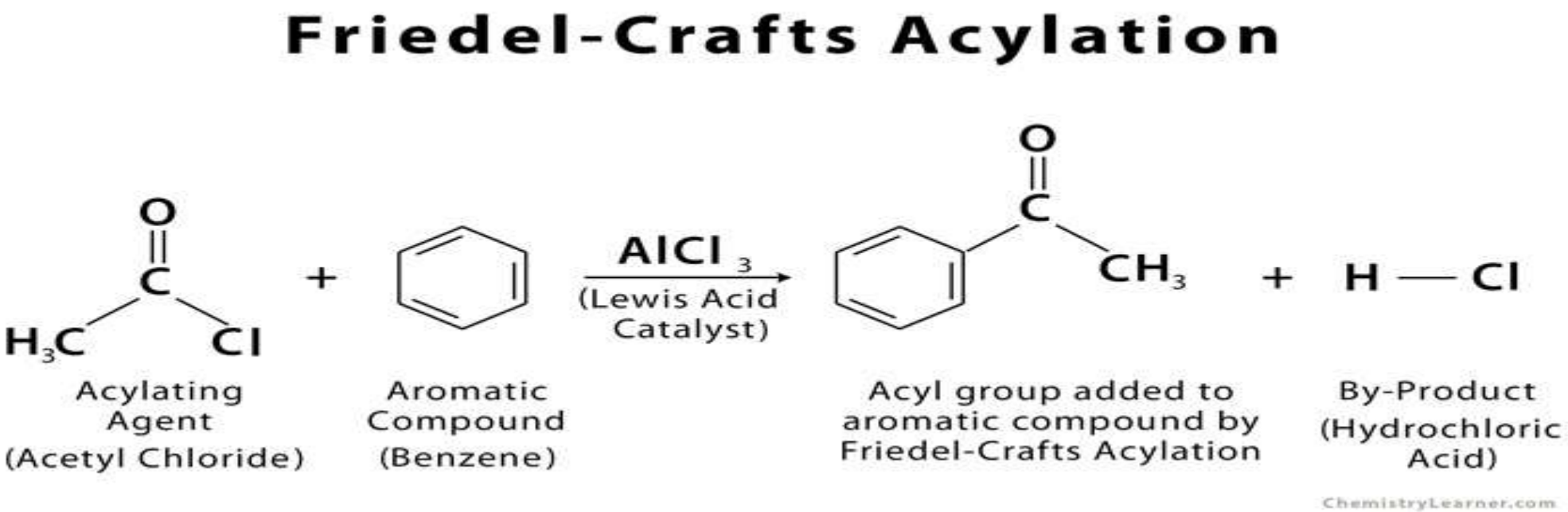

Catalysts in Friedel-Crafts Acylation
luminum Chloride (AlCl3)
most common and effective catalyst
Al
Protic Acids
sts such as sulfuric sed with carboxylic acids
P
Li
Other Lewis Acid
Alternative cataly FeCl3 and BF3
Made wit


Intramolecular
Acylation
Aromatic Substrates

FRIEDALS CRAFT EQUATION



ASSESMENT- EXPLAIN THE REACTION MECHANISM



REFERENCES

- March's Advanced Organic Chemistry (6th ed.) by Michael B. Smith & Jerry March
- Organic Chemistry (by authors such as L. G. Wade or others) — e.g., the chapter titled "Alkylation and Acylation of Aromatic Rings: The Friedel–Crafts Reaction"
- Friedel–Crafts Reactions (RSC Books monograph, Chapter 10)
- Advances in Friedel–Crafts Acylation Reactions: Catalytic and Green Processes by G. Sartori & R. Maggi
- Khan Academy: Friedel-Crafts Acylation" — an instruction video with mechanism step by step.


THANK YOU