

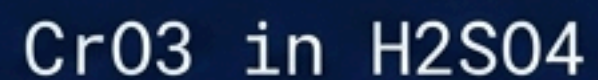
UNIT 8 • ALDEHYDES, KETONES AND CARBOXYLIC ACIDS

Methods of Preparation of Carboxylic Acids

Essential Synthetic Vocabulary

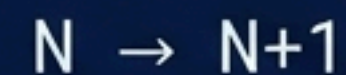
Jones Reagent

A powerful oxidizer capable of taking primary alcohols straight to carboxylic acids.



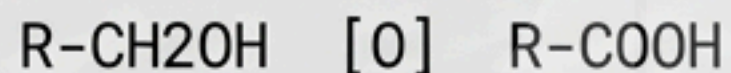
Ascending the Series

A synthetic pathway where the final product contains exactly one more carbon atom than the starting material.

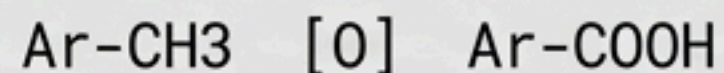


The Six Synthetic Routes

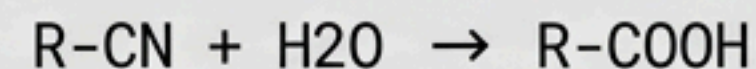
1° Alcohols & Aldehydes (Oxidation)



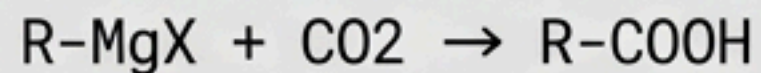
Alkylbenzenes (Oxidation)



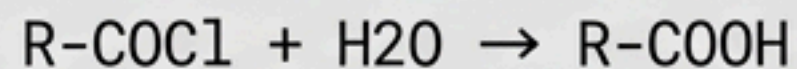
Nitriles & Amides (Hydrolysis)



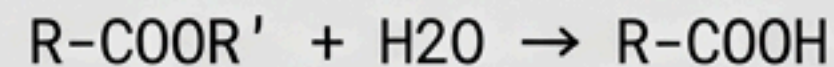
Grignard + Dry Ice



Acyl Halides & Anhydrides (Hydrolysis)



Esters (Hydrolysis)





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$$E=mc^2$$



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Key Highlights

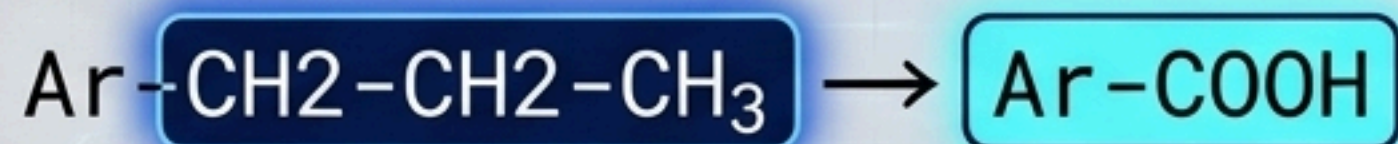
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Alkylbenzene Oxidation Rules

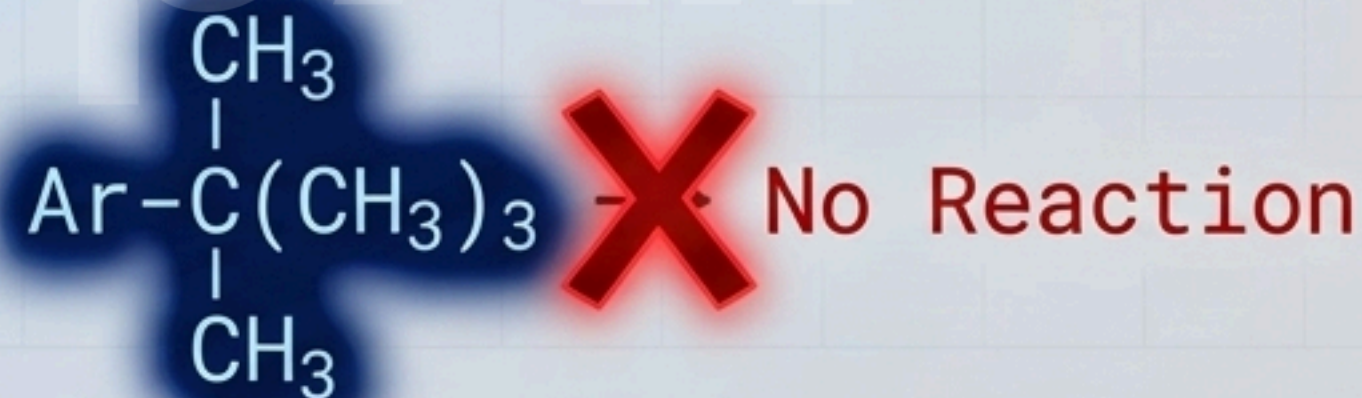
WORKS: 1° & 2° Alkyl Groups

The entire side chain burns down to a single carboxyl group regardless of length.



FAILS: 3° Alkyl Groups

Tertiary structures resist oxidation entirely due to the lack of benzylic hydrogen.



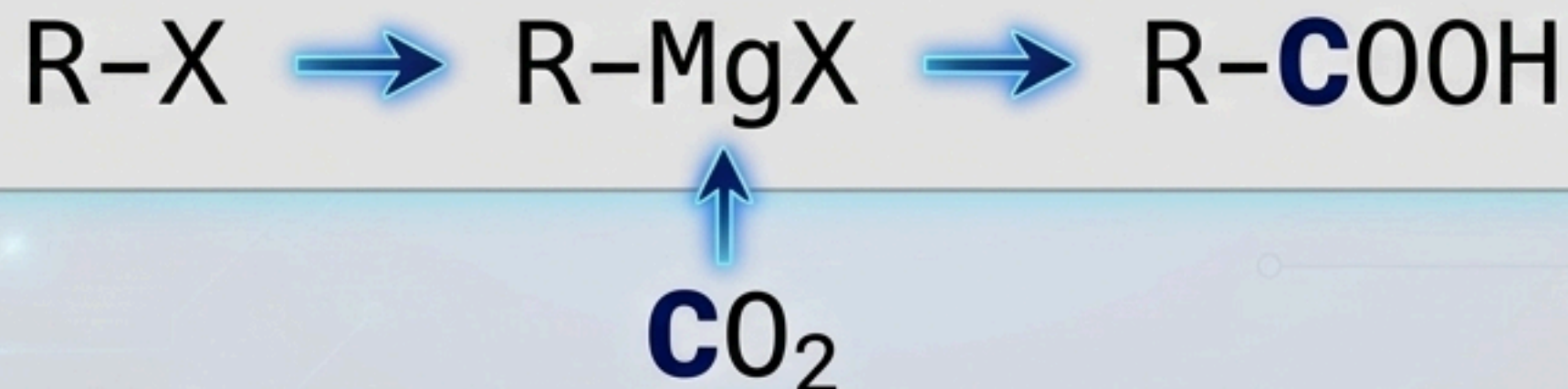
The Chain Extenders: Ascending the Series

Both routes convert an alkyl halide (N carbons) into a carboxylic acid (N+1 carbons).

Pathway 1: Nitrile Hydrolysis



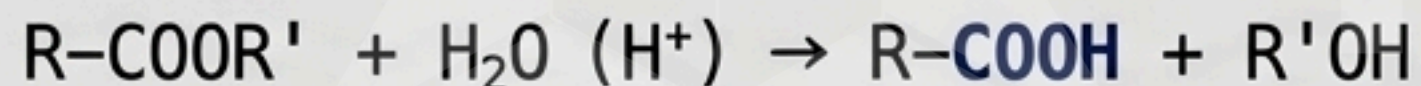
Pathway 2: Grignard + CO₂



Hydrolysis Outcomes: Acidic vs. Basic

Acidic Hydrolysis (H_3O^+)

Direct conversion. Yields the carboxylic acid immediately in one step.



Basic Hydrolysis (NaOH , then H_3O^+)

Two-step pathway requiring subsequent acidification.

Step 1 (Base)

Intermediate: R-COO^- (Carboxylate Ion)



Step 2 (Acid)

Protonation $\rightarrow \text{R-COOH}$

JEE/NEET Blueprint Trap

Synthetic Blueprint

Watch for this...

Miscounting total carbons when using the Grignard or Nitrile pathways.

If the exam asks you to synthesize Propanoic Acid (3 carbons) via a Grignard reagent:

Incorrect Start: Propyl bromide (3 carbons) $\longrightarrow$ Butanoic Acid (4 carbons) ✗

Correct Start: Ethyl bromide (2 carbons) $\xrightarrow{+1 \text{ from CO}_2}$ Propanoic Acid (3 carbons) ✓

RULE: The starting Alkyl Halide must always have **ONE LESS** carbon than your target acid.

Blueprint Takeaways

- **Two primary mechanisms govern the grid.** The 6 synthesis routes broadly fall into severe oxidation (targeting alcohols or alkylbenzenes) or hydrolysis (targeting acid derivatives, nitriles, or Grignard intermediates).
- **Track your carbons.** If your target molecule requires the exact same carbon skeleton, use oxidation or derivative hydrolysis. If you need exactly one more carbon ($N+1$), immediately deploy the need exactly one more carbon ($N+1$), immediately deploy the Grignard + CO_2 or Nitrile pathways.



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