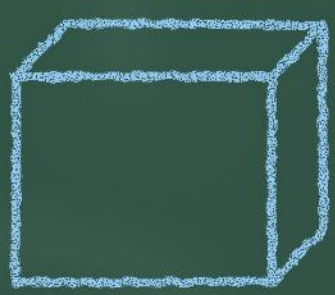
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# Preparing Carboxylic Acids

$$\underset{1\,C}{CH_3Br} \xrightarrow{+1\,C\ ?} \underset{2\,C}{CH_3COOH}$$



dry ice = solid $CO_2$

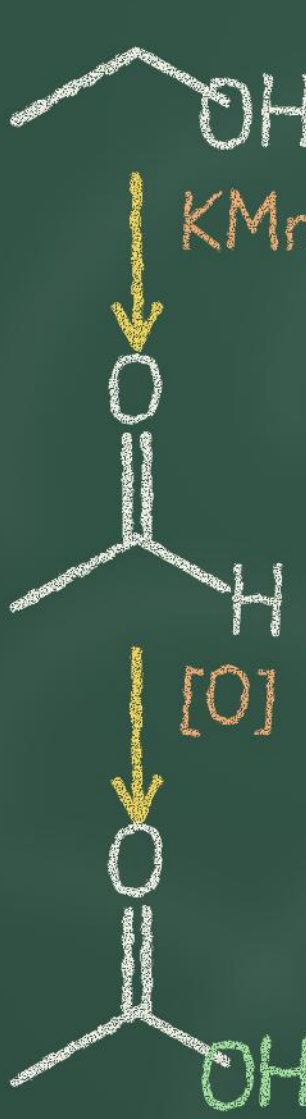
## 4 routes to RCOOH

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# Preparing Carboxylic Acids

## 1. Oxidation




1° alcohol

aldehyde

carboxylic acid

same number of carbons

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# Preparing Carboxylic Acids

## 2. Alkylbenzenes

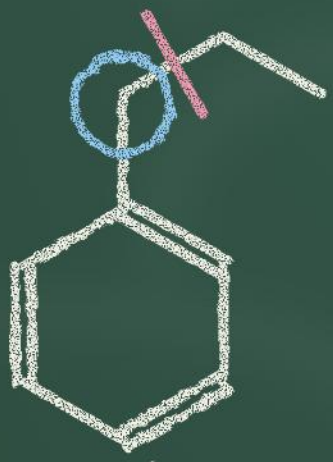


toluene

$KMnO_4$, $OH^-$
then $H_3O^+$




benzoic acid



any chain

[O] → $C_6H_5COOH$

only one COOH stays

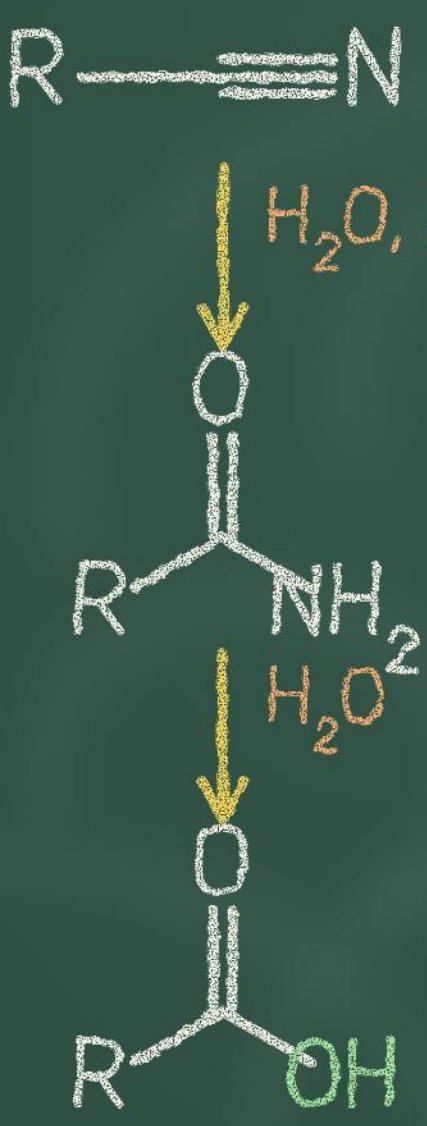
the C on the ring needs an H

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# Preparing Carboxylic Acids

## 3. Hydrolysis




esters, acid chlorides → acids too

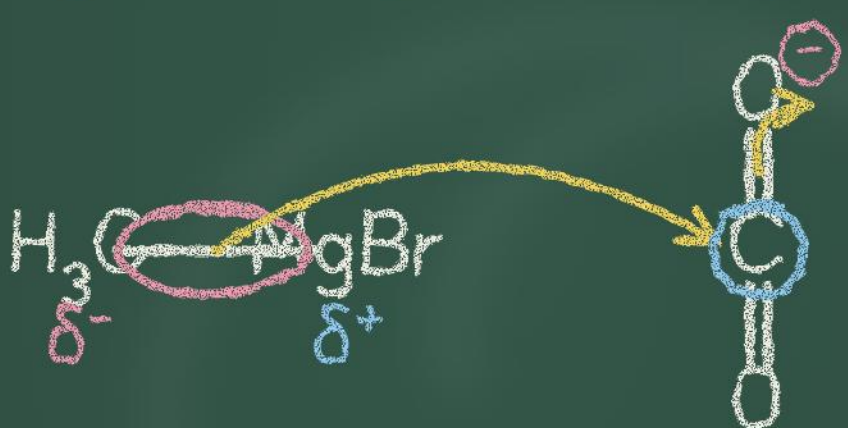
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# Preparing Carboxylic Acids

## 4. Grignard + $CO_2$

$$CH_3Br + Mg \xrightarrow{\text{dry ether}} CH_3MgBr$$



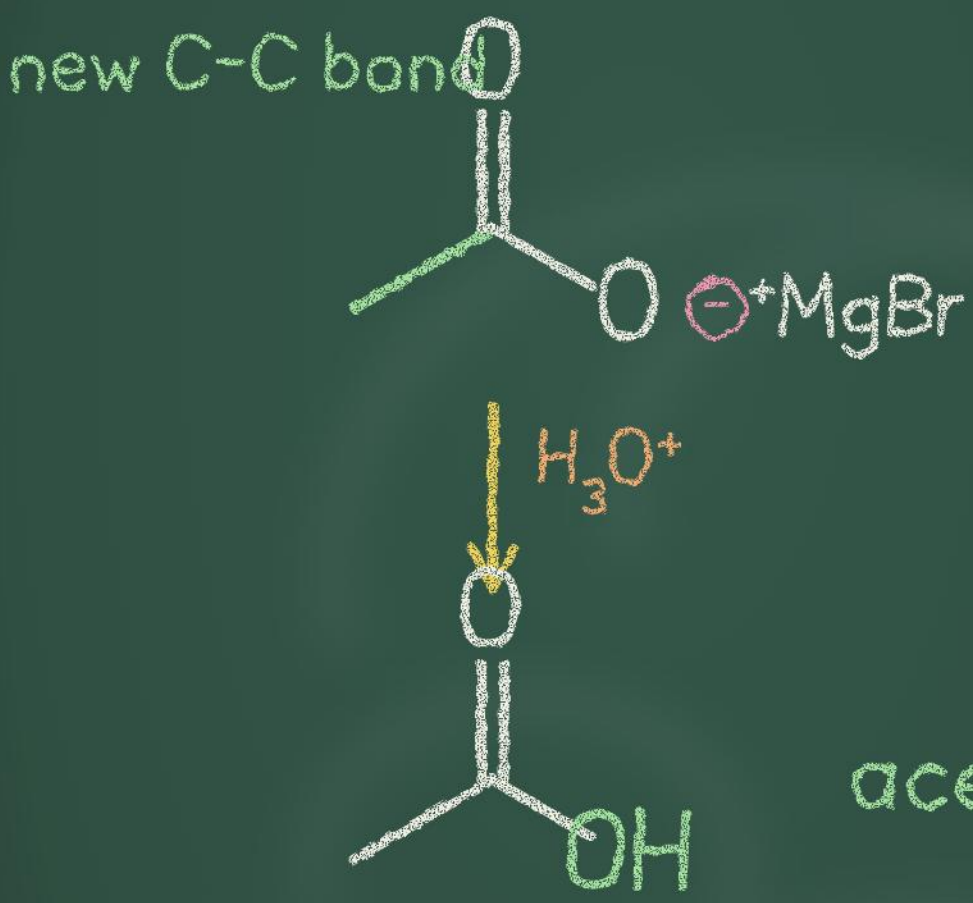

C–Mg bond pair attacks C of $CO_2$

C=O pair moves onto O

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# Preparing Carboxylic Acids




acetic acid

$CH_3Br$: 1 C → $CH_3COOH$: 2 C

**+1 carbon**

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# Preparing Carboxylic Acids

## 4 routes to RCOOH

1. $RCH_2OH$, $RCHO$ $\xrightarrow{[O]}$ $RCOOH$

2. $ArCH_3$ (any chain) $\xrightarrow{KMnO_4}$ $RCOOH$

3. $RCN$, esters $\xrightarrow{H_2O}$ $RCOOH$

4. $RMgX + CO_2$ $\xrightarrow{H_3O^+}$ $RCOOH$

+1 C

next: why acids boil so high?