ULTIMATE KCET

CRASH COURSE 2026

Chemistry | Lecture - 01

Amines

By – Sreeja Ma'am

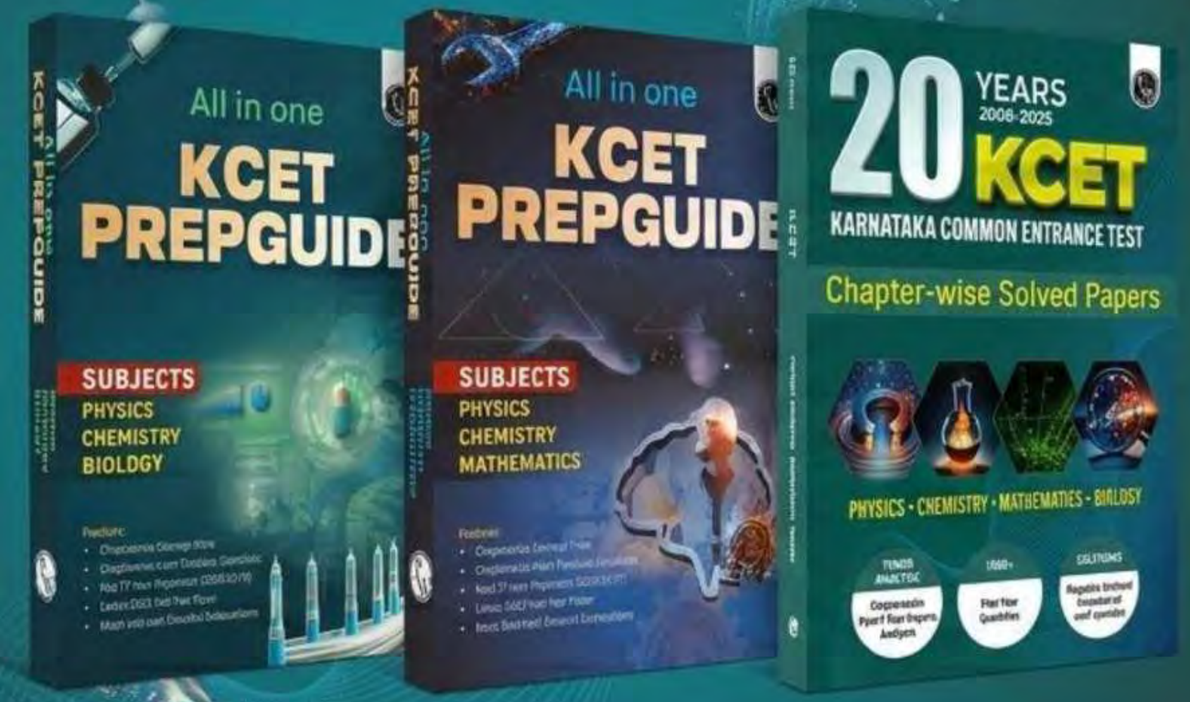
Recap *of previous lecture*

1. Mcqs – Alcohols, phenols and ethers
2. Aldehydes, ketones and carboxylic acids – Synopsis

Topics *to be covered*

1. Aldehydes, ketones and carboxylic acids – Synopsis and mcq – continuation
2. Amines – Synopsis

PHYSICS WALLAH



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Amines

Year	Topic	No. of Questions
2024	Coupling reaction	1
2023	Why aniline does not undergo Friedel Craft's reaction, Reagents in the conversion of aniline to nitrobenzene	2
2022	Carbylamine reaction, About secondary amine	2
2021	The method by which aniline can not be prepared , Product name in ammonolysis, IUPAC name of the compound	3
2020	Conversion from Nitrobenzene to Meta bromo aniline, Hinsberg's reagent	2
2019	Solubility of amines, Nitration of aniline	2
2018	Coupling reaction – Yellow dye	1
2017	Increasing order of basic nature of amines in aqueous solutions	1

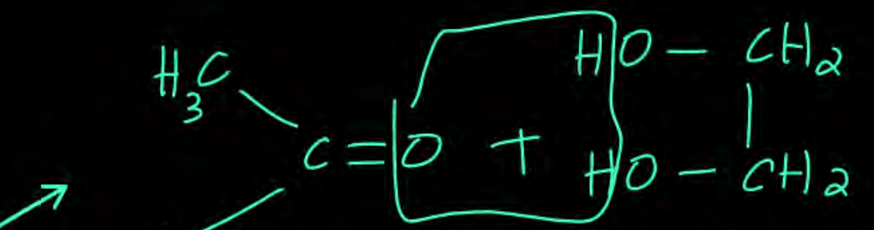
Aldehydes ketones carboxylic acids

Aldehydes, ketones and carboxylic acids

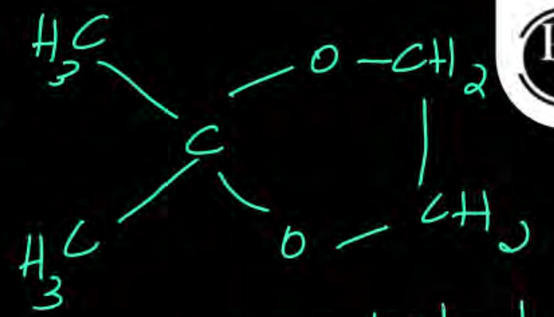
Year	Topics	Number of Questions
2024	Functional isomers, decarboxylation reaction	02
2023	RCHO+ RMgBR + conc H_2SO_4 +B_2H_6 - Functional isomers	02
2022	Reagent to oxidise primary alcohols to aldehydes, IUPAC name, Aldehydes + alcohols = reactionn , Aldehyde preparation HVZ reaction	04
2021	Iodoform test, reaction of acetone undergoing aldol condensation reaction, Choosing reducing reagents which reduced carboxylic acids to alcohol, Sequence based reaction,	03
2020	Aldol condensation reaction,	02
2019	HVZ reaction, Rosenmund reduction reaction + Cannizaro reaction	02
2018	Haloform reaction, Cumene process – acetone , Wolf kishner reduction reaction, Étard reaction	04
2017	Decarboxylation reaction, Cannizaro reaction , Solubility of carboxylic acids, Reagent to reduce ketones	04
2016	Cannizaro reaction, sequence based reaction,	02

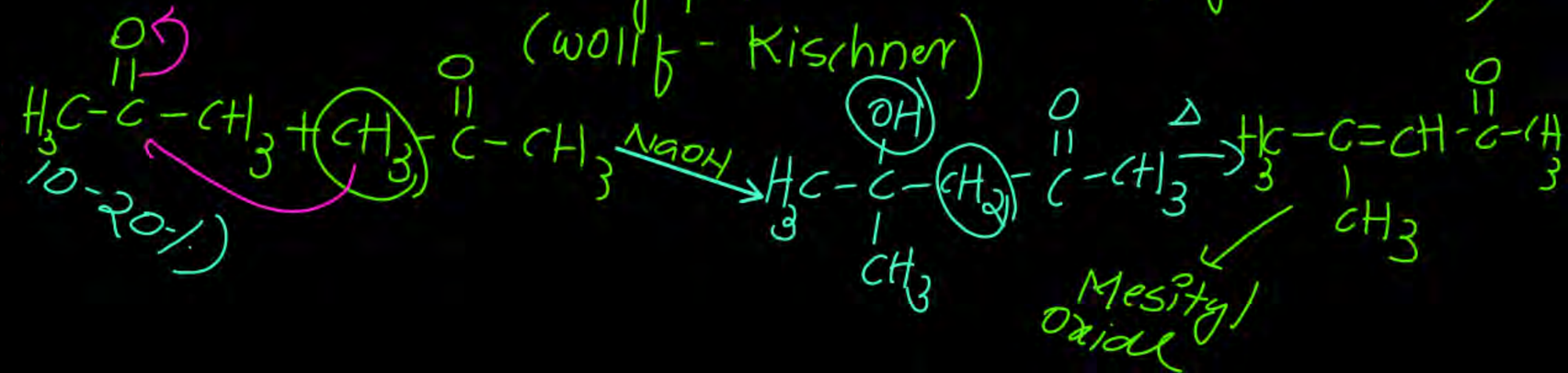
Chemical Properties of aldehyde & ketone

- Conc. KOH or NaOH (50:1) (cannizaro reaction)
- aldehyde (reduction) / ketone → $Zn\text{-}Hg$, conc HCl (clemmensen reduction reaction) → CH_2 (hydrocarbon)
- aldehyde (reduction) / ketone → basic → H_2N-NH_2, Ethylene glycol, KOH (wolff-Kischner) → CH_2 (hydrocarbon)
- Aldol $Ba(OH)_2$, NaOH, KOH (dil. 10-20:1)



$\xrightarrow[+\text{dry HCl}]{-H_2O}$





aldehyde with no alpha hydrogen

Cannizzaro reaction

50% KOH / NaOH
conc. KOH/NaOH

$2\,H-\overset{O}{\overset{\|}{C}}-H \xrightarrow{KOH\ conc.} H_3C-OH + HCOO^{\ominus}K^{\oplus}$

$2\,C_6H_5-\overset{O}{\overset{\|}{C}}-H \xrightarrow[50\%]{KOH} C_6H_5-\underset{OH}{\underset{|}{CH}}-C_6H_5 + C_6H_5-\overset{O}{\overset{\|}{C}}-O^{\ominus}K^{\oplus}$

Chemical Properties of aldehyde & Ketone

Oxidation of aldehyde

$H_3C-\overset{O}{\overset{\|}{C}}-H \xrightarrow{[O]} H_3C-\overset{O}{\overset{\|}{C}}-OH$

$Cu^{2+} + e^{\ominus}$

→ Tollen's reagent
→ Felhing solution
→ $KMnO_4$ / $K_2Cr_2O_7$
→ Br_2 water.

(Roschell's salt
Sodium potassium tartarate)

Tollen's reagent
→ $[Ag(NH_3)_2]^{\oplus}\,NO_3^{\ominus}$

Felhing solution

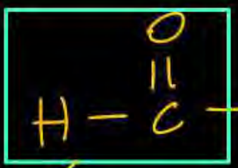
A: aq. $CuSO_4$ solution
B: alk. $\underset{|}{\overset{COONa}{CH-OH}}$ $\underset{|}{\overset{COOK}{CH-OH}}$

Oxidation of ketone

→ donot react with Tollen's reagent Felhing solution

$R-\overset{O}{\overset{\|}{C}}-\underset{|}{CH}-R' \xrightarrow[KMnO_4\ /\ K_2Cr_2O_7]{conc.\ HNO_3}$ Carboxylic acid

Felhing solution do not oxidize aromatic aldehyde.



formic acid

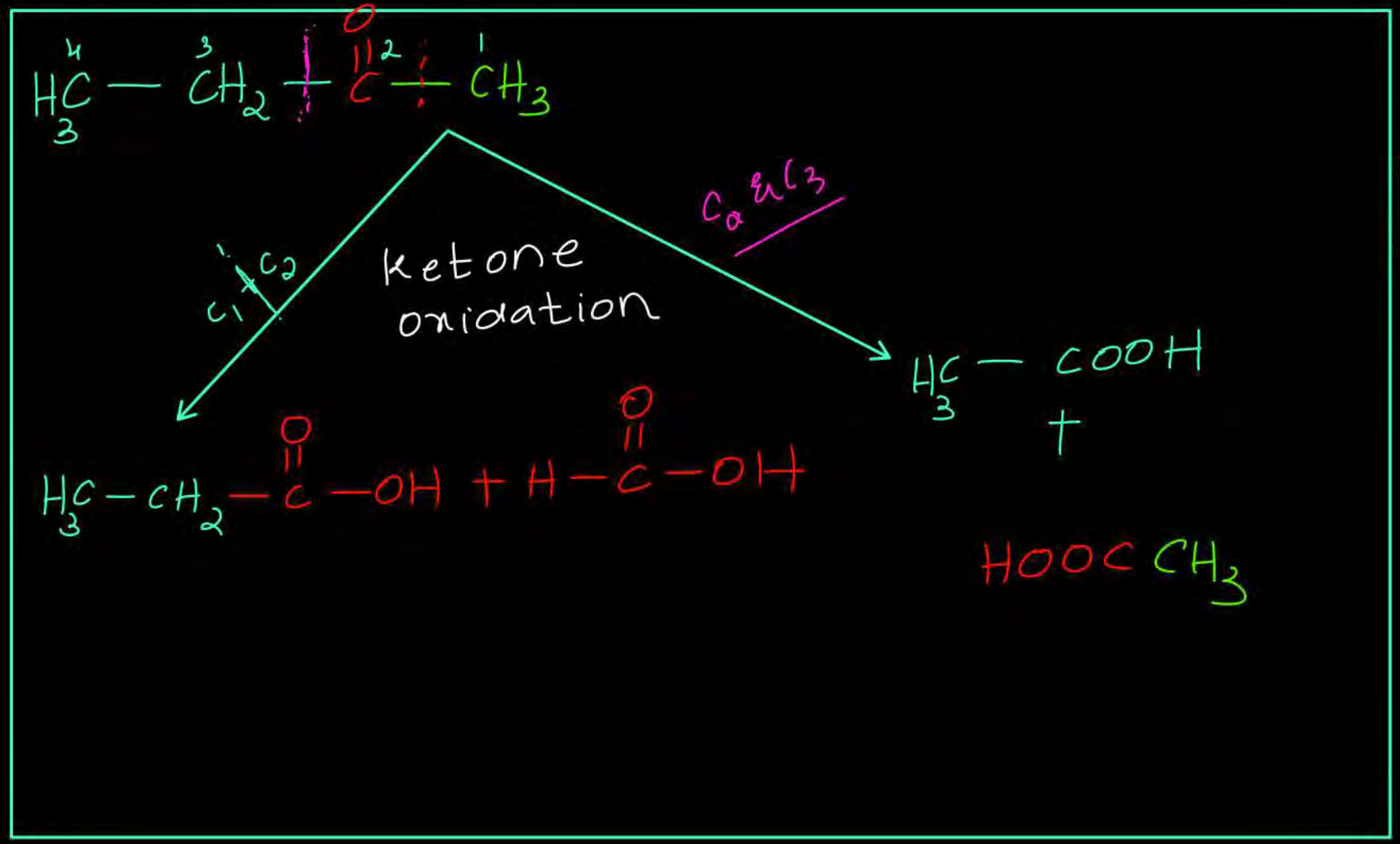
Tollen's reagent will be answered by this aldehyde group.

Tollen's reagent

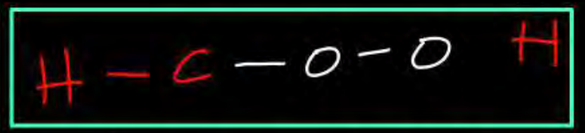
will react with aliphatic & aromatic aldehyde.

Felhing's solution reacts → only with aliphatic aldehyde

↓ it shows no reaction with aromatic aldehyde



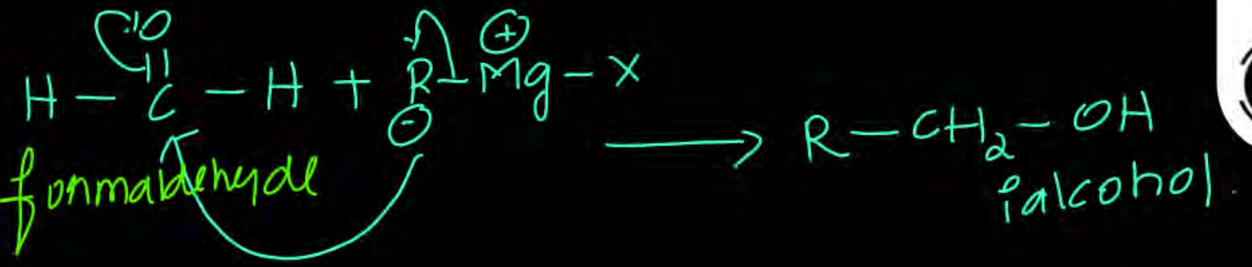
CH_3 →



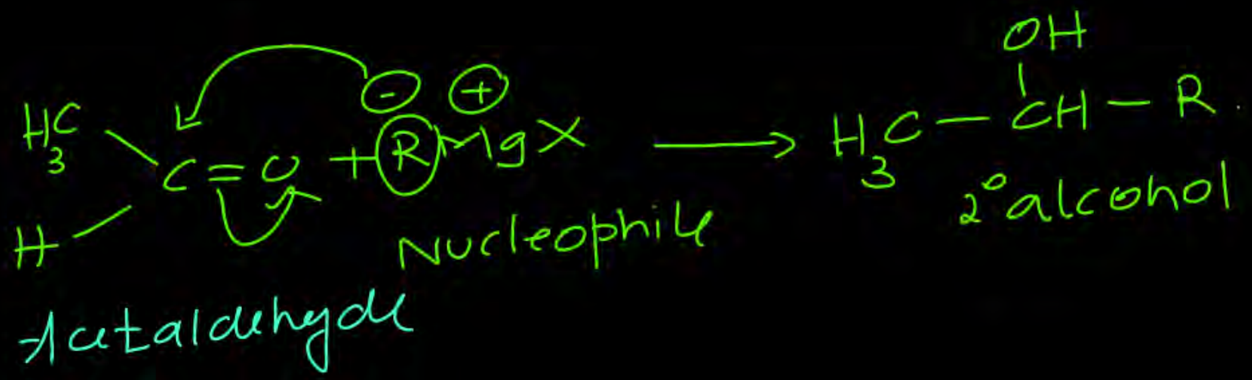
formic acid.

Chemical Properties of aldehyde & ketone

with formaldehyde



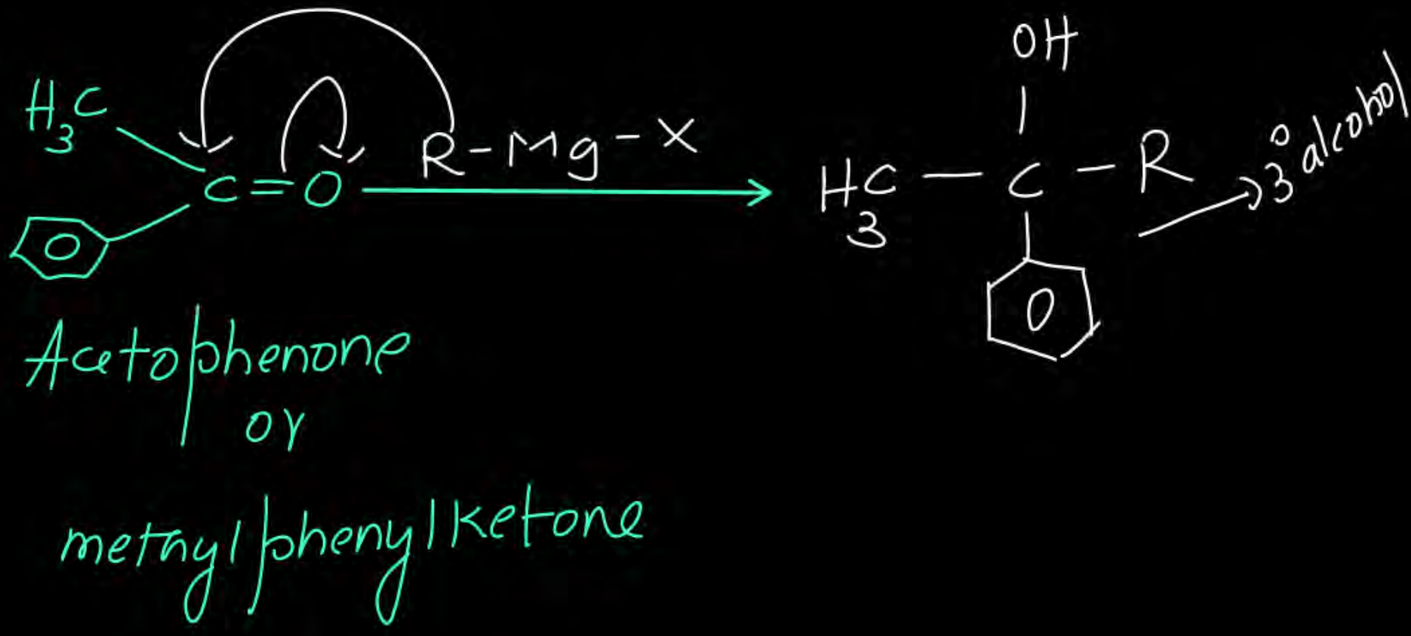
with any other aldehyde

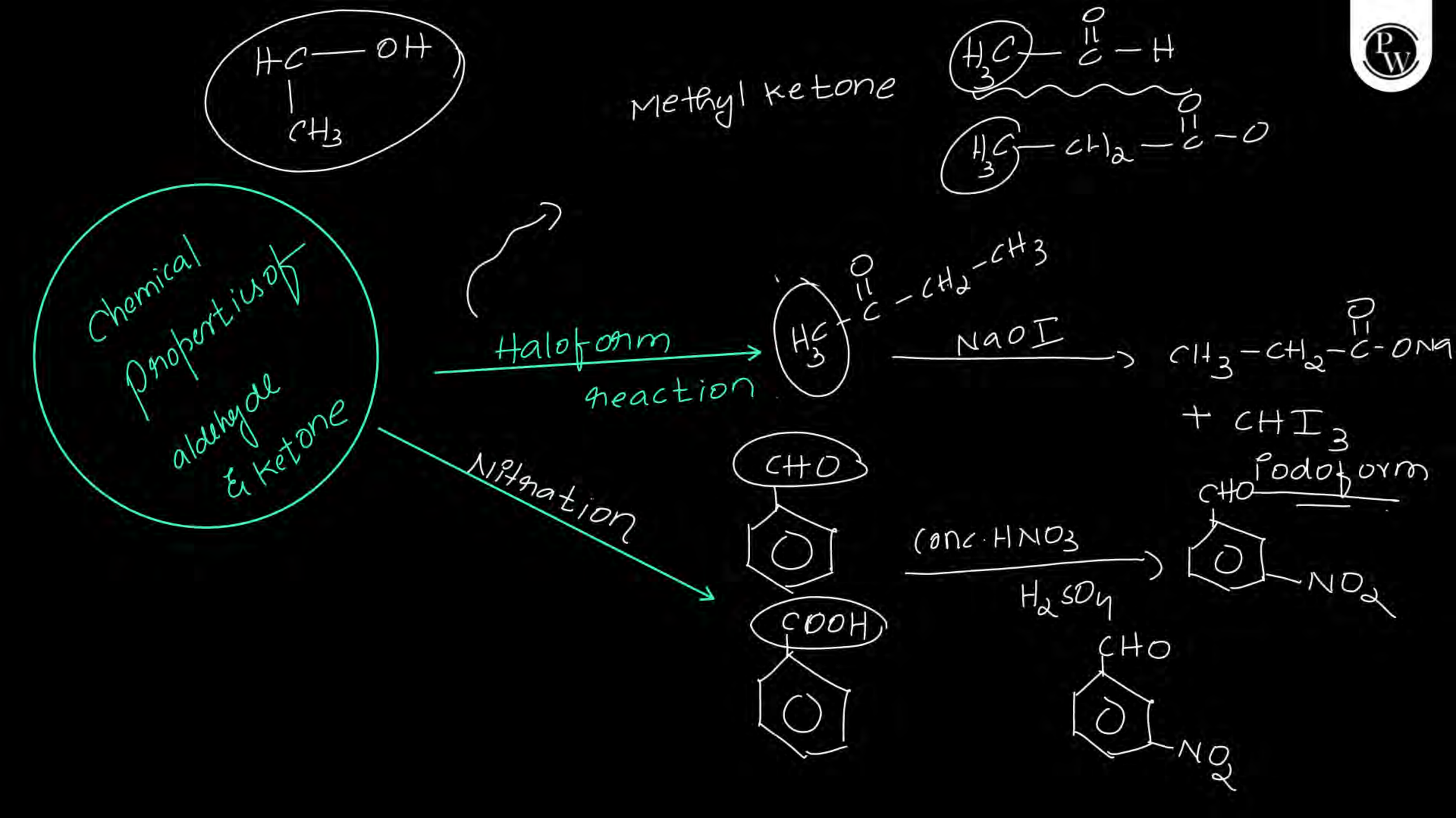


with ketone

↓

3° alcohol




Chemical Properties of aldehyde & ketone
Methyl ketone
Haloform reaction
NaOI
Iodoform
+ CHI3
Nitration
conc. HNO3
H2SO4
CHO
COOH
NO2

Strong oxidizing agent ↑

oxidizing agent ↑

Carboxylic acid

Methods of Preparation

- [alcohol] Jones reagent (CrO_3 + conc H_2SO_4), $KMnO_4$, $K_2Cr_2O_7$, conc. HNO_3.

$$R-CH_2-OH \xrightarrow{[O]} R-COOH + H_2O$$

- [aldehyde]

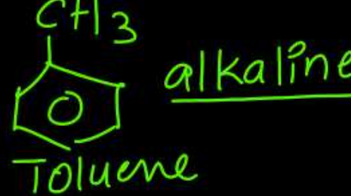
$$R-\overset{O}{\overset{\|}{C}}-H \xrightarrow{\text{Tollen's reagent / Fehling solution / } Br_2 \text{ water } [O]} R-\overset{O}{\overset{\|}{C}}-OH$$

↳ Mild oxidizing agent

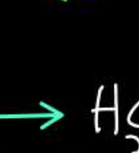
- ketone

$$R-\overset{O}{\overset{\|}{C}}-CH_2-R \xrightarrow[\text{[strong O.A]}]{[O]} R-\overset{O}{\overset{\|}{C}}-OH + R'-COOH$$

- hydrocarbon



$$\xrightarrow{\text{alkaline } KMnO_4}$$



- from cyanide or nitrile.

$$H_3C-C\equiv N \xrightarrow[\text{complete hydrolysis}]{H_3O^{\oplus}} H_3C-COOH + NH_3 \uparrow$$

- from amide $\left[R-\overset{O}{\overset{\|}{C}}-NH_2\right]$

$$H_3C-\overset{O}{\overset{\|}{C}}-NH_2 \xrightarrow{\text{water}} H_3C-\overset{O}{\overset{\|}{C}}-OH$$

(via $OH^{\ominus}$)

Methods of Preparation of Carboxylic acid

- from acyl chloride:

$$R-\overset{O}{\overset{\|}{C}}-Cl + H_3\overset{\oplus}{O} \longrightarrow R-\overset{O}{\overset{\|}{C}}-OH$$

acylchloride → acid

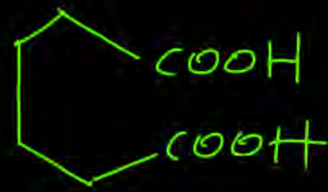
- Hydrolysis of ester [Saponification reaction]

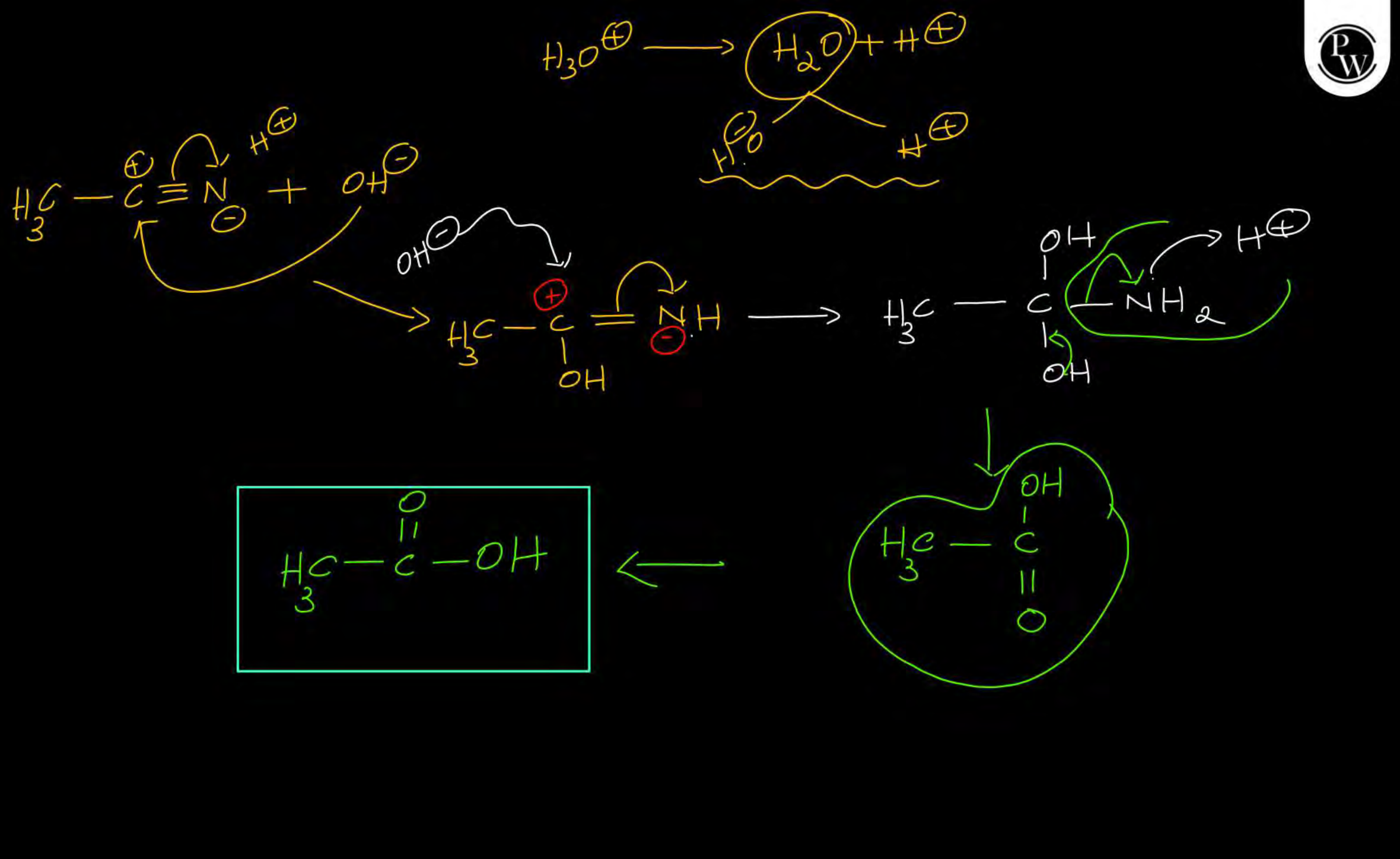
$$R-\overset{O}{\overset{\|}{C}}-O-R' \xrightarrow{(H_2O)\ (NaOH)} R-\overset{O}{\overset{\|}{C}}-OH + R'OH$$

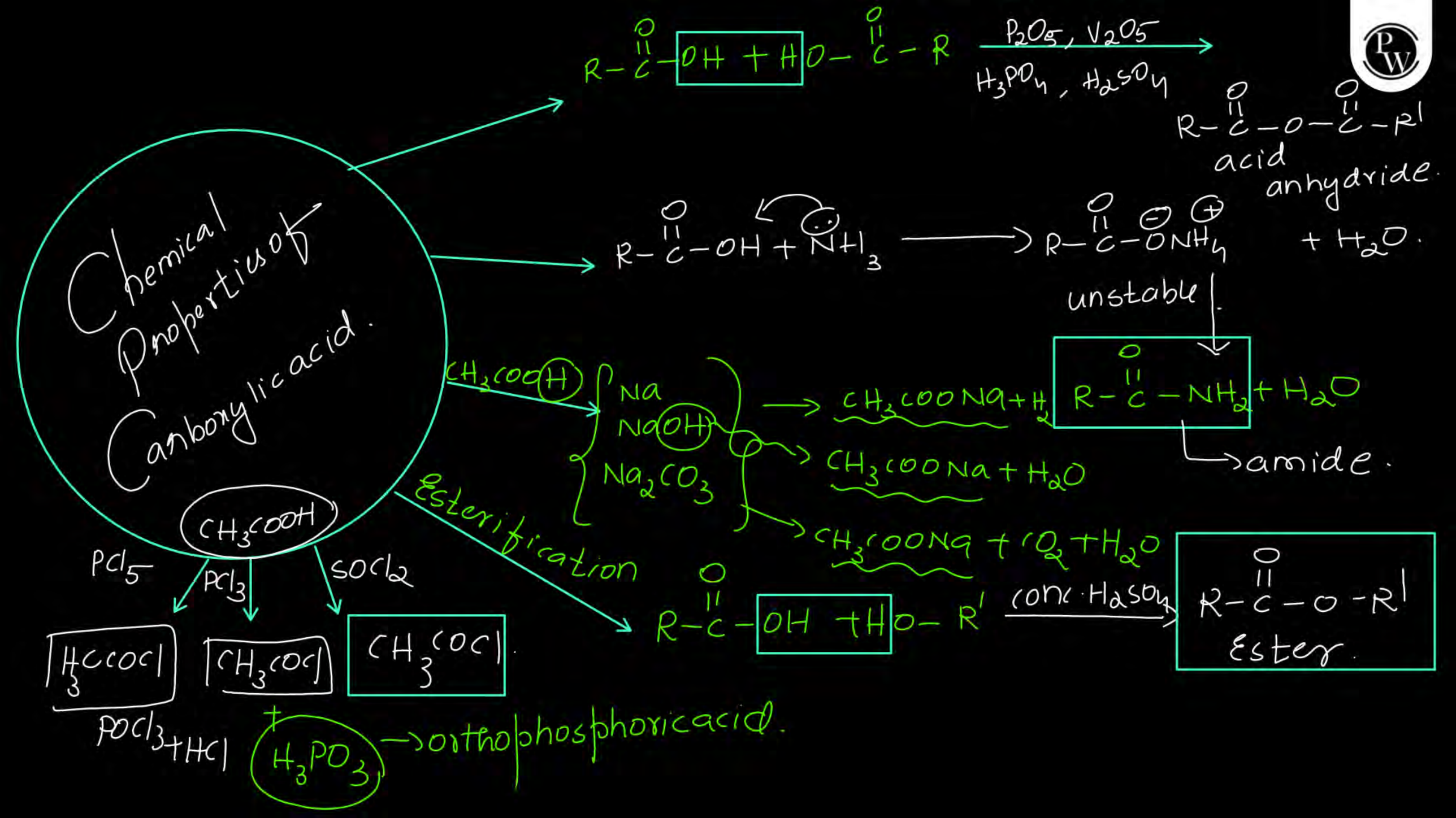
acid + alcohol

- alkene (C=C) [$KMnO_4 + H_2SO_4$]

$$\xrightarrow{[KMnO_4 + H^{\oplus}]}$$




$H_3O^{\oplus}$
H_2O
$H^{\oplus}$
$H_3C-C\equiv N$
$OH^{\ominus}$
$H_3C-C(OH)=NH$
$H_3C-C(OH)_2-NH_2$
$H_3C-C(=O)-OH$


Chemical Properties of Carboxylic acid.
$R-\overset{O}{\overset{\|}{C}}-OH + H-O-\overset{O}{\overset{\|}{C}}-R$
P_2O_5, V_2O_5
H_3PO_4, H_2SO_4
$R-\overset{O}{\overset{\|}{C}}-O-\overset{O}{\overset{\|}{C}}-R^1$
acid anhydride.
$+ H_2O$.
$R-\overset{O}{\overset{\|}{C}}-OH + NH_3$
$R-\overset{O}{\overset{\|}{C}}-ONH_4$
unstable
$R-\overset{O}{\overset{\|}{C}}-NH_2 + H_2O$
amide.
CH_3COOH
Na
NaOH
Na_2CO_3
$CH_3COONa + H_2$
$CH_3COONa + H_2O$
$CH_3COONa + CO_2 + H_2O$
Esterification
$R-\overset{O}{\overset{\|}{C}}-OH + H-O-R^1$
conc. H_2SO_4
$R-\overset{O}{\overset{\|}{C}}-O-R^1$
Ester.
CH_3COOH
PCl_5
PCl_3
$SOCl_2$
H_3CCOCl
CH_3COCl
CH_3COCl
$POCl_3 + HCl$
H_3PO_3
orthophosphoric acid.

Chemical Properties of acids.

HVZ reaction

$CH_3-COOH \xrightarrow[\Delta]{X_2/Red\,P}$ (α-hydrogen)

$CH_2Cl-COOH$.

α-chloroacetic acid.

Decarboxylation

$R-COO^{\ominus}Na^{\oplus} \xrightarrow{NaOH+CaO} RH + Na_2CO_3$

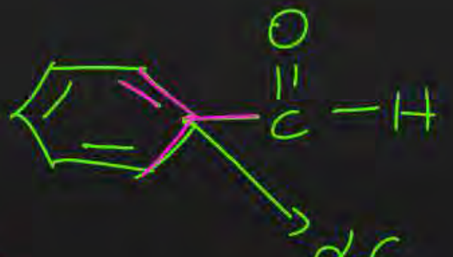
hydrocarbon.

QUESTION

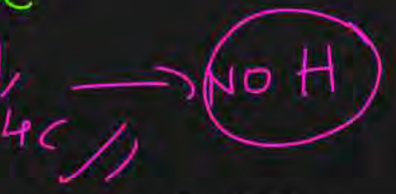
#Q. Which of the following statements about benzaldehyde is not true?

A. Reduces Tollens' reagent

B. Undergoes Aldol condensation

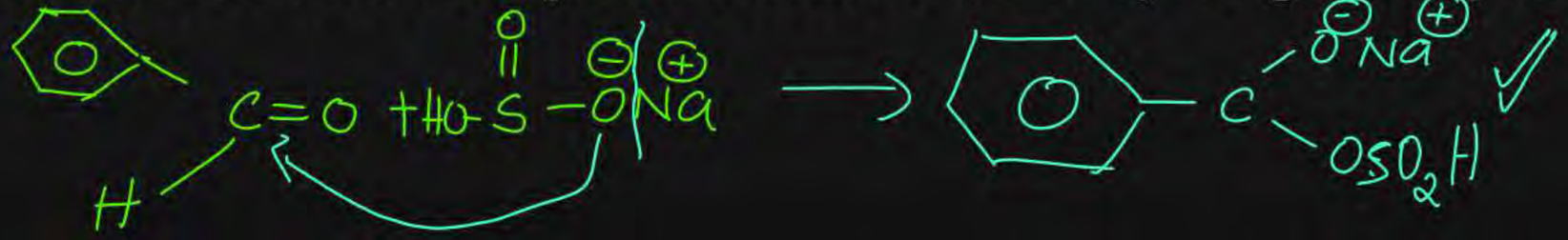


C. Undergoes Cannizzaro's reaction



D. Forms an addition compound with sodium hydrogen sulphite

(NaHSO3)



QUESTION

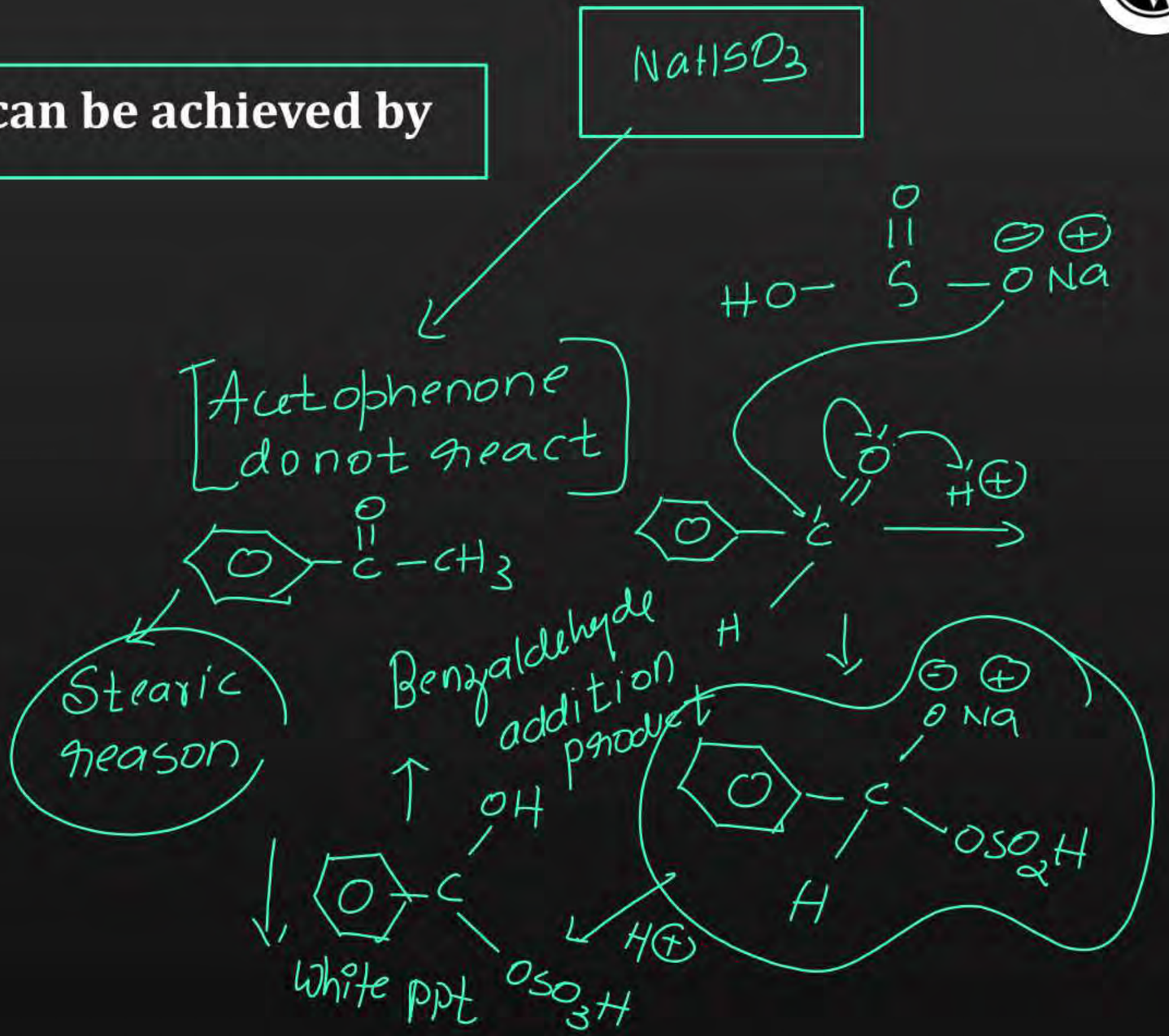
#Q. Oxidation of Butan-2-one can be achieved by

A Tollens' reagent ✗

B Conc. HNO_3 ✓

C Br_2 water ✗

D Atmospheric oxidation ✗



QUESTION

purification & separation of aldehyde from ketone.

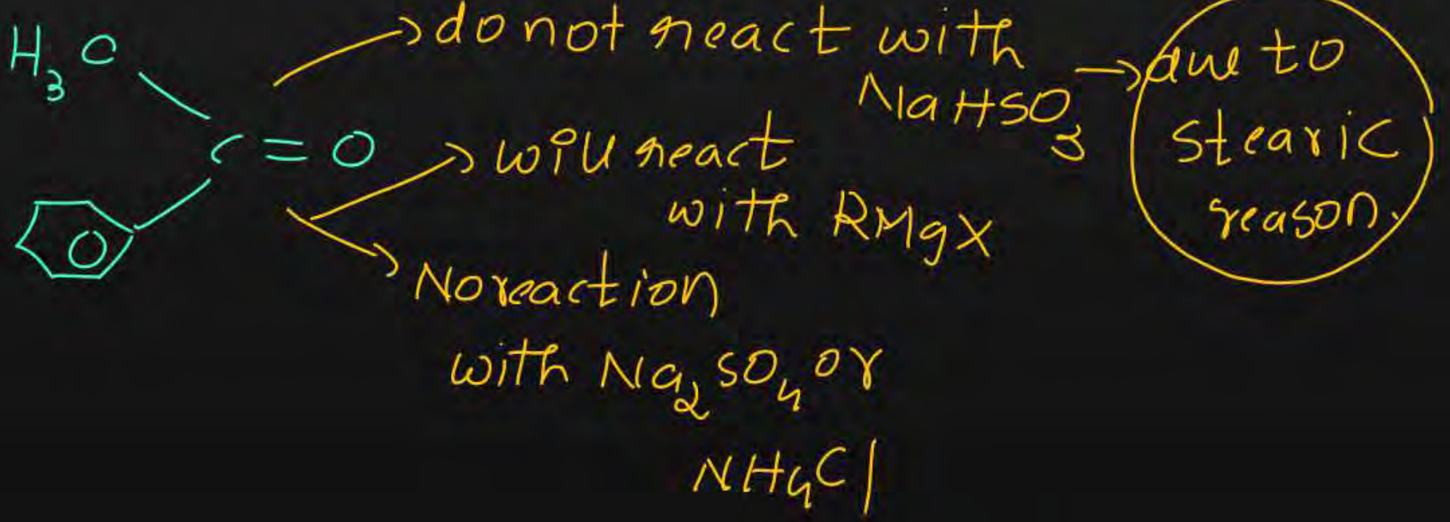
#Q. **Which of the following reagents is used to distinguish acetone and acetophenone?**

A. $NaHSO_3$ ✓

B. Grignard reagent

C. Na_2SO_4

D. NH_4Cl



QUESTION

$CN \xrightarrow{H_3O^{\oplus}} COOH$ ⟶ complete hydrolysis ⟶ $COOH$
partial hydrolysis ⟶ $CONH_2$

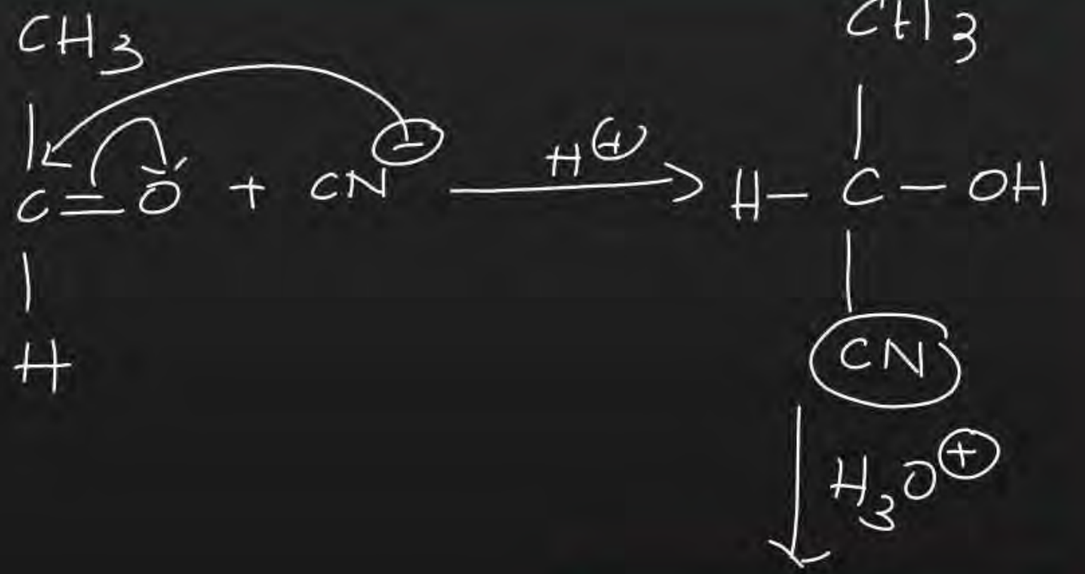
#Q. Cyanohydrin of which of the following forms lactic acid?

(A) HCHO

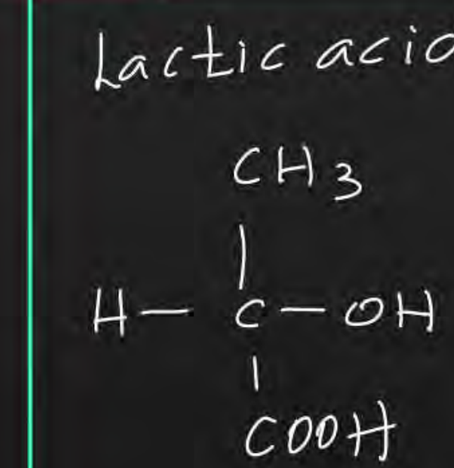
(B) CH_3COCH_3

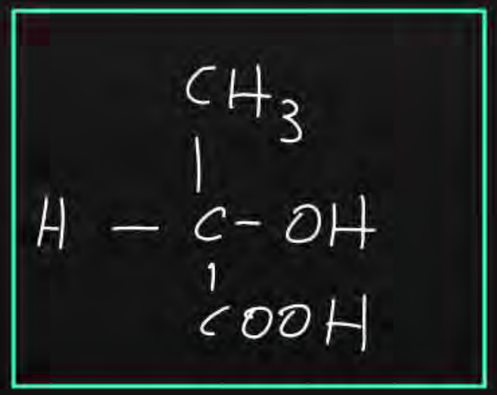
(C) CH_3CHO

(D) CH_2CH_2CHO



Lactic acid






H
CH3 – C = O
Acetaldehyde
+HCN
H
CH3 – C – OH
CN
Cyanohydin
+H2O
H
CH3 – C – OH
COOH
Lacticacid

QUESTION

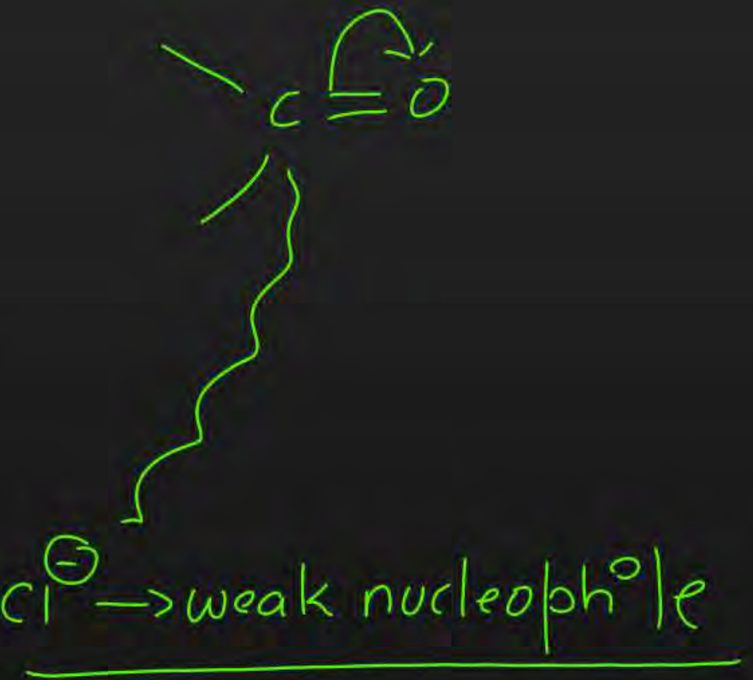
#Q. Aldehydes and ketones do not give addition reaction with

A HCN

B $NaHSO_3$

C Both

D $HCl_{(aq)}$



QUESTION

$Ag^{+} + e^{-} \longrightarrow Ag\downarrow$

#Q. On heating acetaldehyde with ammoniacal silver nitrate solution, we get

A CH3OH ✗

B Silver acetate

C HCHO ✗

D Silver mirror ($Ag\downarrow$)

$H_3C-\overset{O}{\overset{\|}{C}}-H \xrightarrow{\text{Tollen's reagent}} CH_3-\overset{O}{\overset{\|}{C}}-O^{\ominus}$ acetate ion $+ Ag\downarrow$

$[Ag(NH_3)_2]^{\oplus}$

$H_3CCHO + 2[Ag(NH_3)_2]^{\oplus} + OH^{\ominus} \longrightarrow CH_3COO^{\ominus} + Ag\downarrow + H_2O$

Silver mirror

$H_3CCOO^{\ominus}Ag^{\oplus}$ ✗

QUESTION

#Q. Identify the correct order of boiling points of the following compounds

I) $CH_3CH_2CH_2CH_2OH$ II) $CH_3CH_2CH_2CHO$ III) $CH_3CH_2CH_2COOH$

A. I > II > III

B. III > I > II

C. I > III > II

D. III > II > I

B.P

acid > alcohol > Amines > aldehyde > ketone

extensive hydrogen bonding

QUESTION

#Q. Which of the following reactions gives violet colour with neutral ferric chloride?

A. Acetic acid

B. Salicylic acid

C. Formic acid

D. Benzoic acid

QUESTION

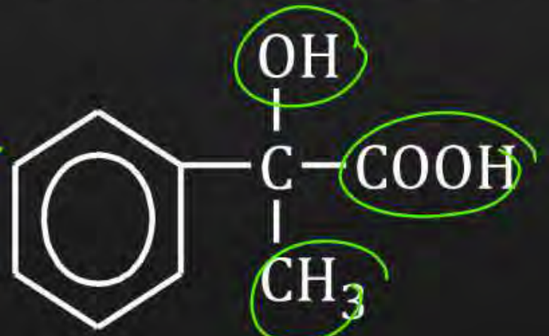
#Q. **In a set of reactions acetic acid yielded a product S.**

$$CH_3COOH \xrightarrow{SOCl_2} P \xrightarrow[\text{Anhy. } AlCl_3]{\text{Benzene}} Q \xrightarrow{HCN} R \xrightarrow{H.OH} S$$

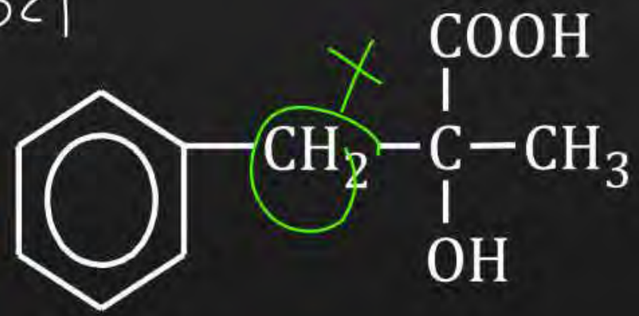
$P = CH_3COCl$

The structure of S would be

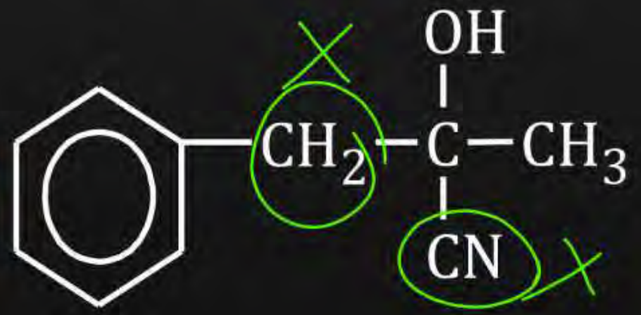
A



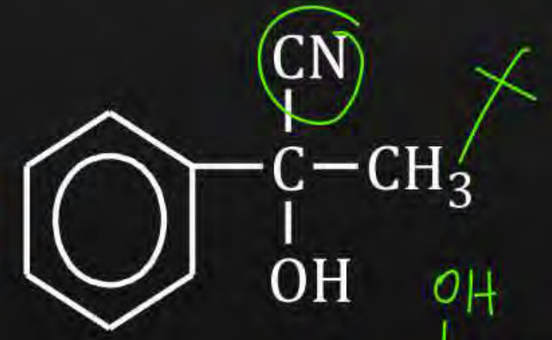
B

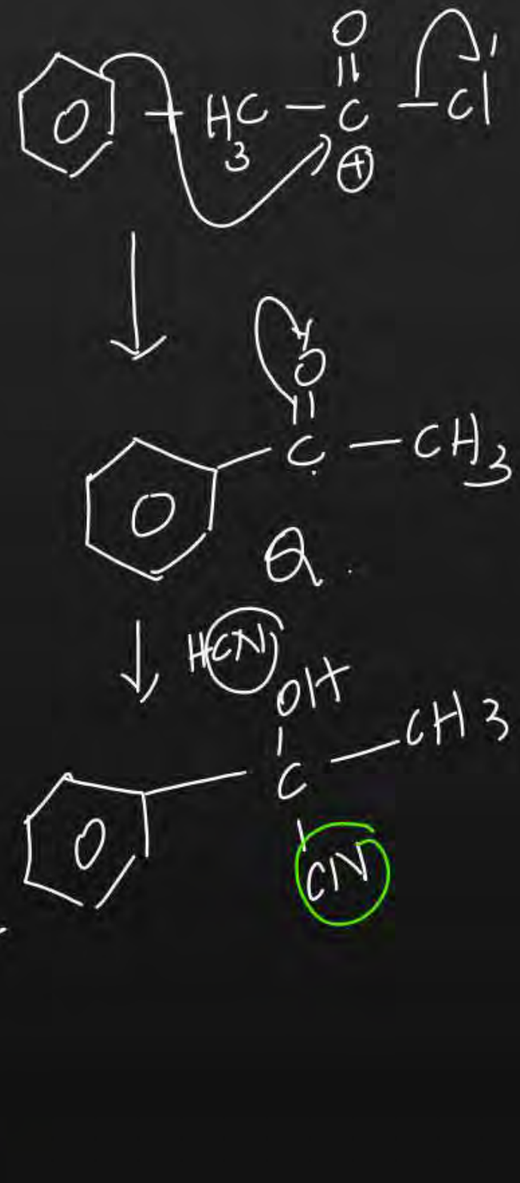


C



D





QUESTION

#Q. Glacial Acetic acid is

A Pure acetic acid at 100°C

B Acetic acid mixed with methanol

C Pure acetic acid at 0°C

D Pure acetic acid around 16.6°C

QUESTION

#Q. What is Z in the following sequence of reactions?

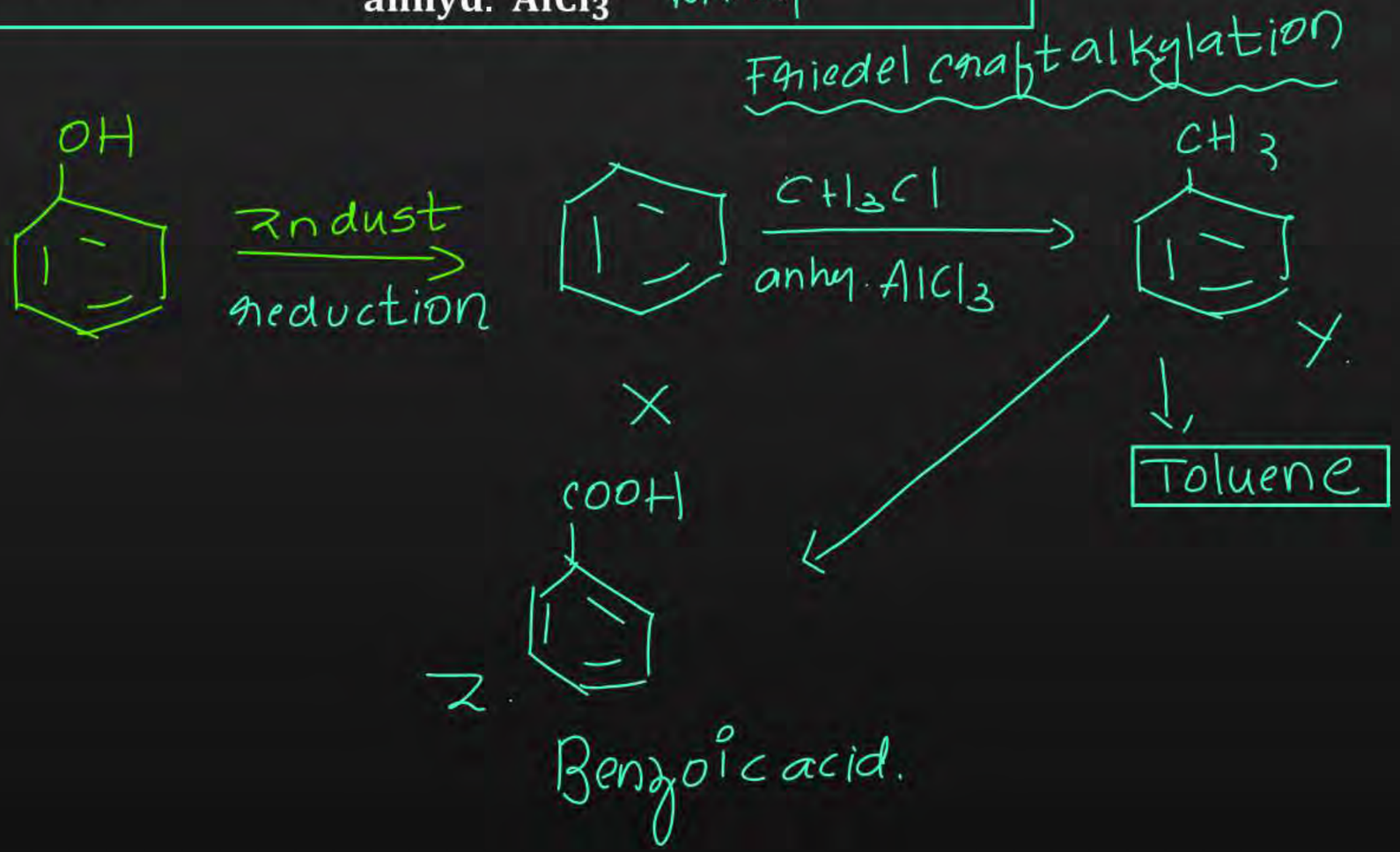
$$\text{Phenol} \xrightarrow{\text{Zn dust}} X \xrightarrow[\text{anhyd. } AlCl_3]{CH_3Cl} Y \xrightarrow[KMnO_4]{\text{Alkaline}} Z$$

A Toluene

B Benzene

C Benzoic acid

D Benzaldehyde



QUESTION

#Q. The reaction, $RCH_2CH_2COOH \xrightarrow[Br_2]{\text{Red P}} R-CH_2-\underset{\underset{Br}{|}}{CH}-COOH$

is called

A Reimer – Tiemann reaction

B Hell – Volhard Zelinsky reaction

C Cannizzaro reaction

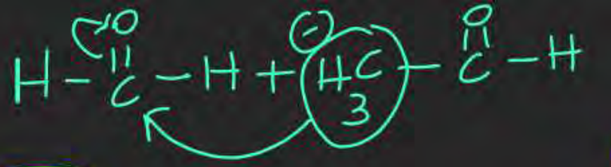
D Sandmeyer reaction

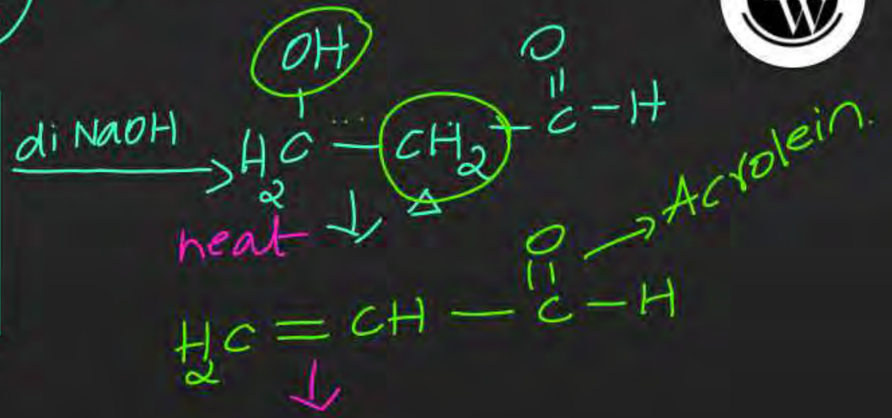
QUESTION

Cross aldol

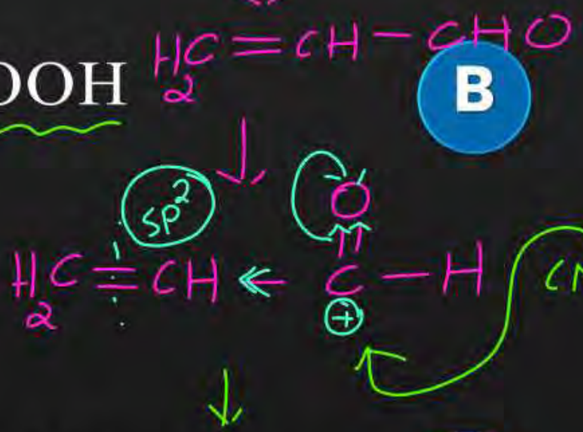
#Q. $CH_3CHO + HCHO \xrightarrow[\text{Heat}]{\text{dil. NaOH}} A \xrightarrow[H_3O^{\oplus}]{HCN} B$

The structure of compound B is



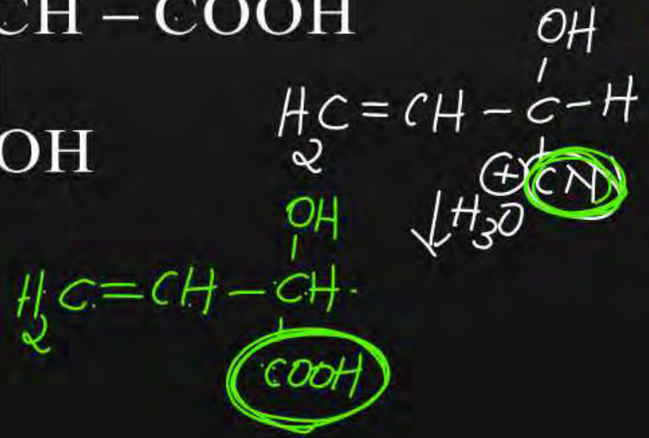


(A) $CH_2 = CH - \underset{\underset{OH}{|}}{CH} - COOH$



(B) $CH_2 = CH - \underset{\underset{CN}{|}}{CH} - OH$ ✗

(C) $CH_3CH_2 - \underset{\underset{OH}{|}}{CH} - COOH$ ✗



(D) $CH_3 - \underset{\underset{OH}{|}}{CH} - COOH$ ✗

QUESTION

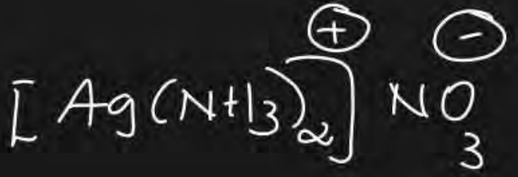
#Q. Tollens' reagent is

A Ammoniacal cuprous chloride

B Ammoniacal cuprous oxide

C Ammoniacal silver bromide

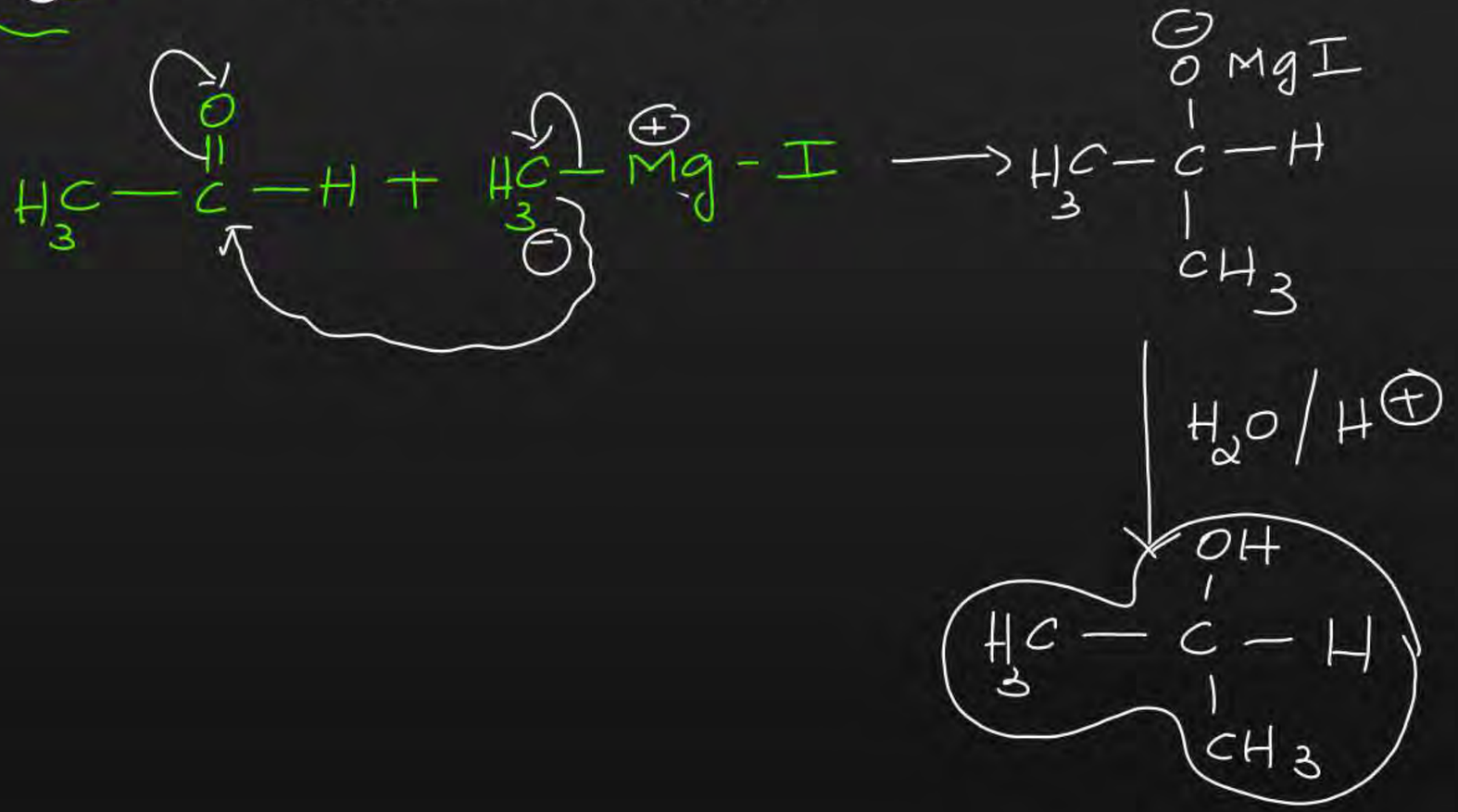
D Ammoniacal silver nitrate.



QUESTION

#Q. Identify the product Y in the sequence

$$CH_3CHO + CH_3MgI \xrightarrow{\text{Ether}} X \xrightarrow{H_2O/H^+} Y$$



A CH_3OH

B CH_3CH_2OH

C $(CH_3)_2CHOH$

D $(CH_3)_3COH$

QUESTION

#Q. Which one of the following pair is not correctly matched ?

A $> C = O \xrightarrow{\text{Clemmenssen's reduction}} > CH_2$

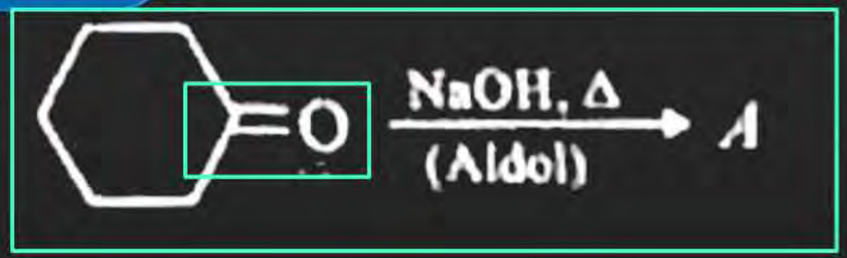
B $> C = O \xrightarrow{\text{Wolff–Kishner reduction}} > CHOH$

C $-COCl \xrightarrow{\text{Rosenmund;s reduction}} CHO$

D $-C \equiv N \xrightarrow{\text{Stephen reduction}} CHO$

QUESTION

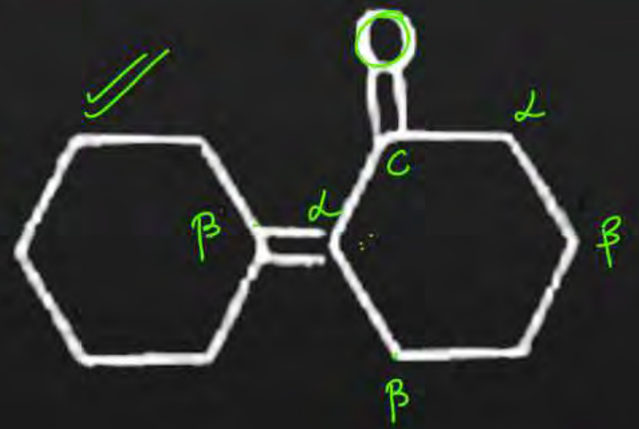
#Q.



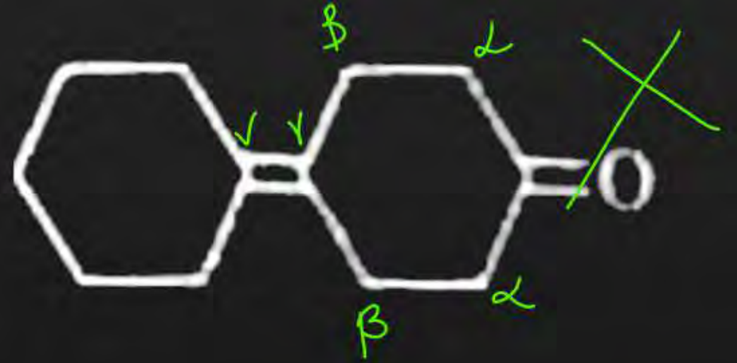
α - β -> unsaturated

β
C = C - C
α O

A

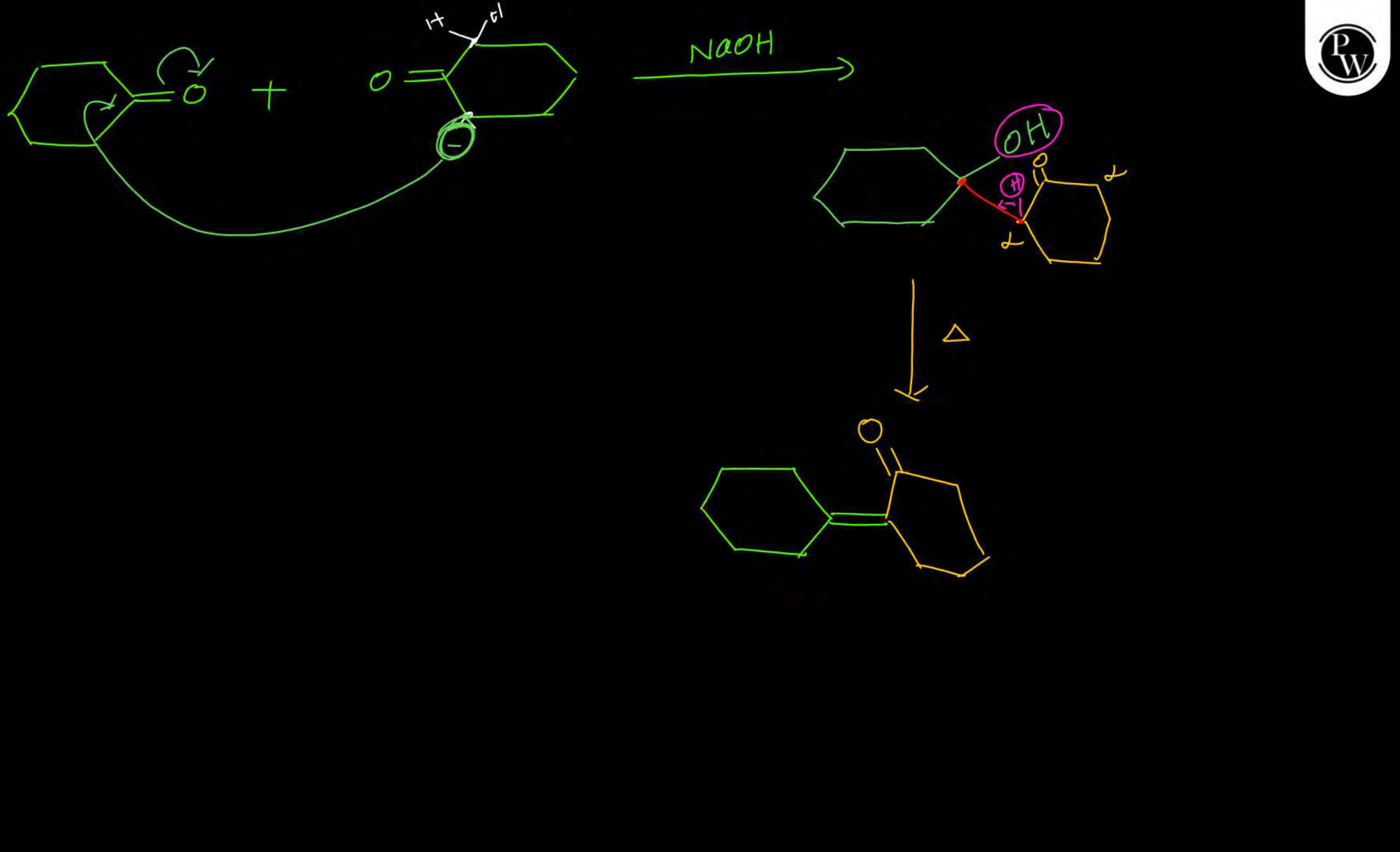


B



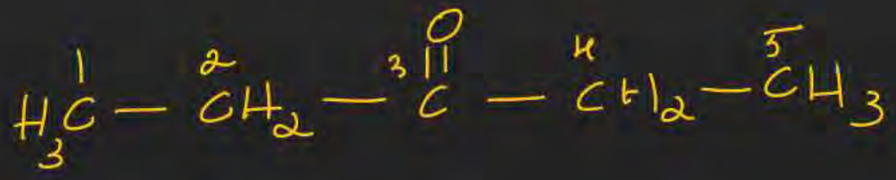
C

D

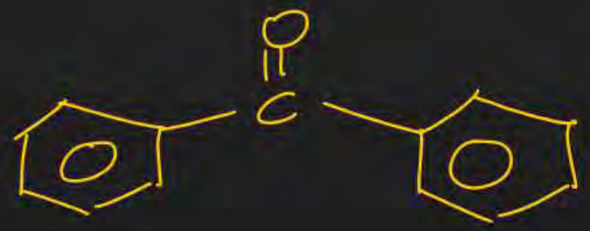

NaOH
OH
Δ

QUESTION

#Q. Which is mixed ketone?

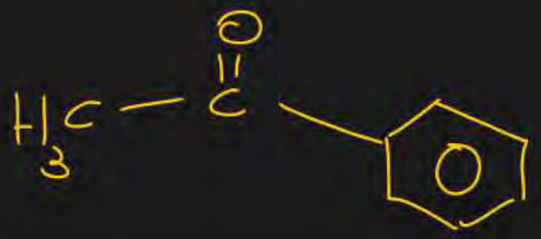


A 3-Pentanone



B Benzophenone

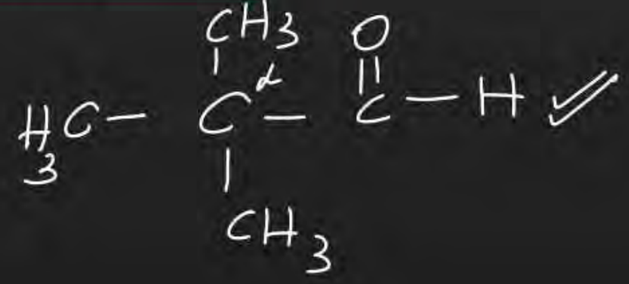
C Acetophenone



D All of these.

QUESTION

#Q. Cannizzaro reaction is not given by

A Trimethyl acetaldehyde ⇝ 

B Acetaldehyde → Aldol condensation.

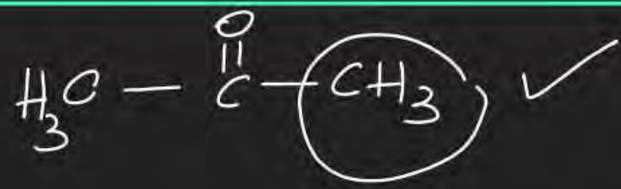
C Benzaldehyde

D Formaldehyde.

QUESTION

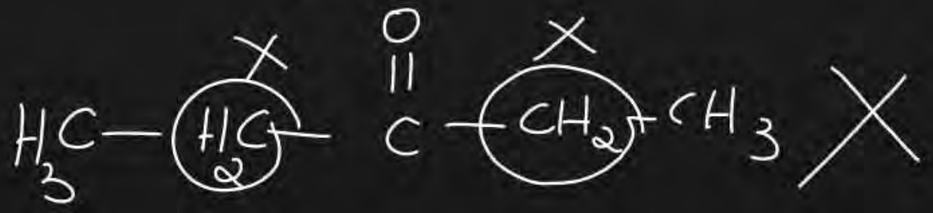
#Q. The compound that will not give iodoform on treatment with alkali and iodine is

A Acetone

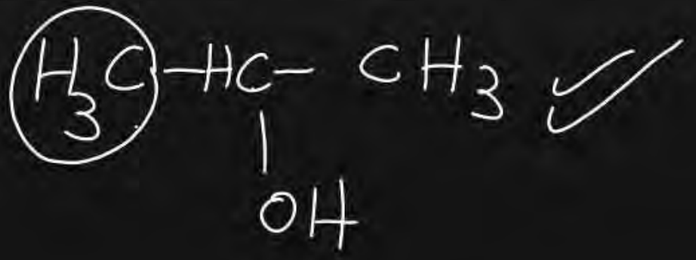


B Ethanol

C Diethyl ketone

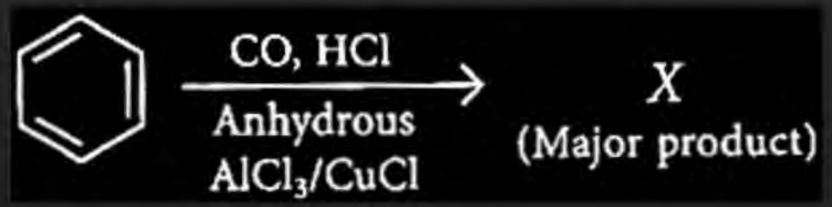


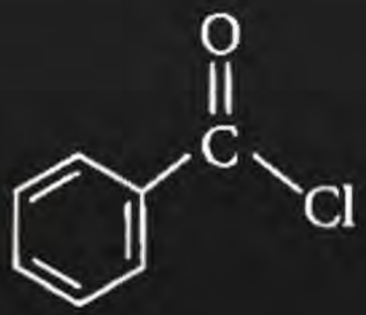
D Iso-propyl alcohol.

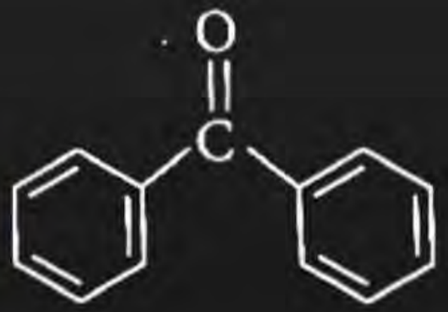


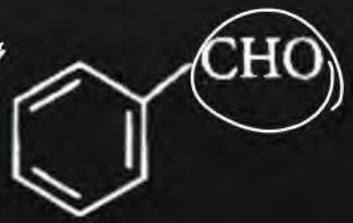
Question

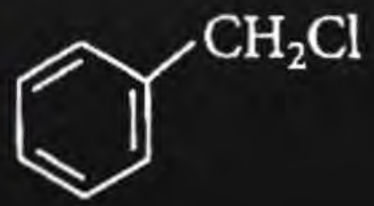
Identify major product "X" formed in the following reaction.



A 

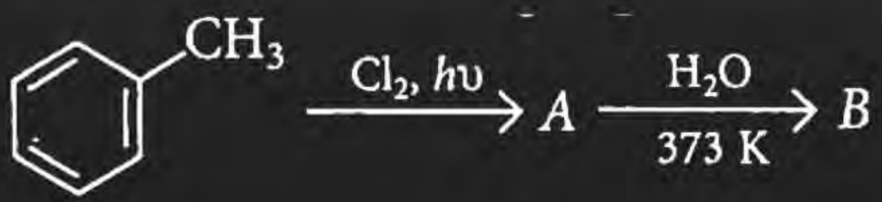
B 

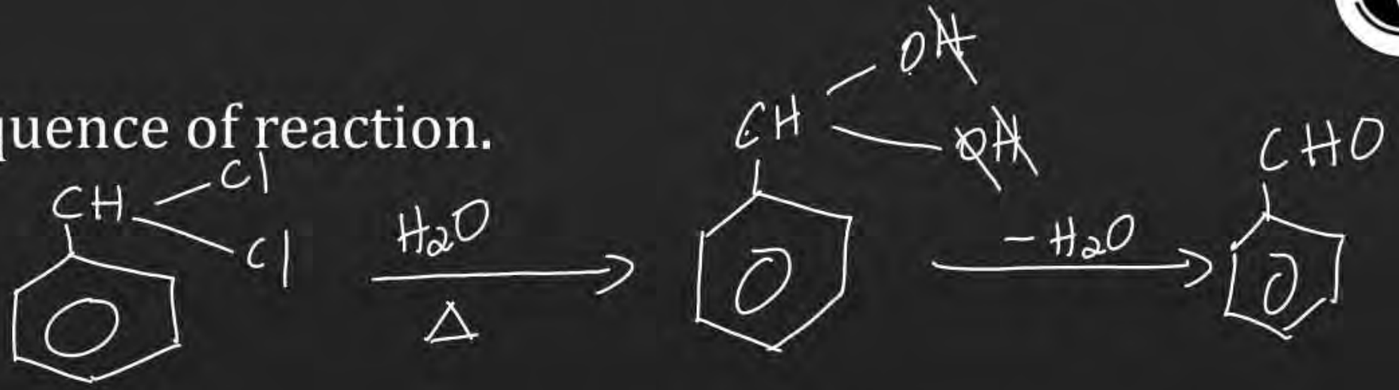
C 

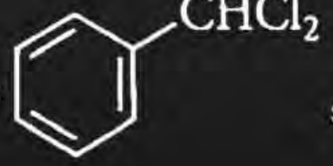
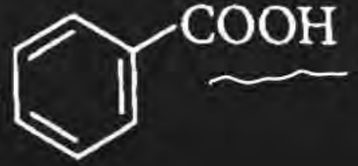
D 

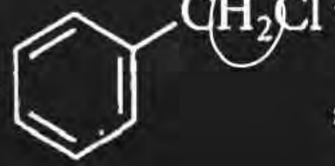
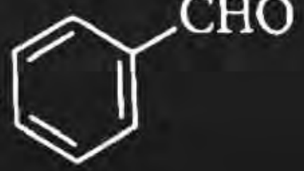
Question

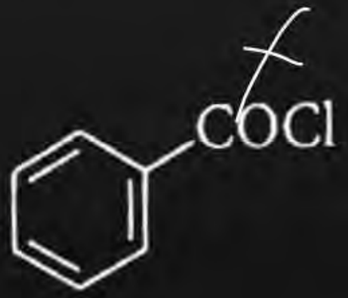
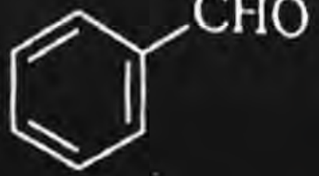
Identify A and B in the following sequence of reaction.

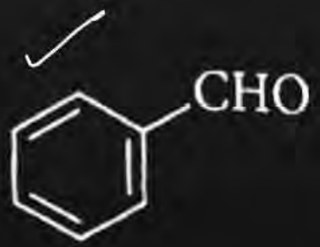




(A) $A =$  , $B =$ 

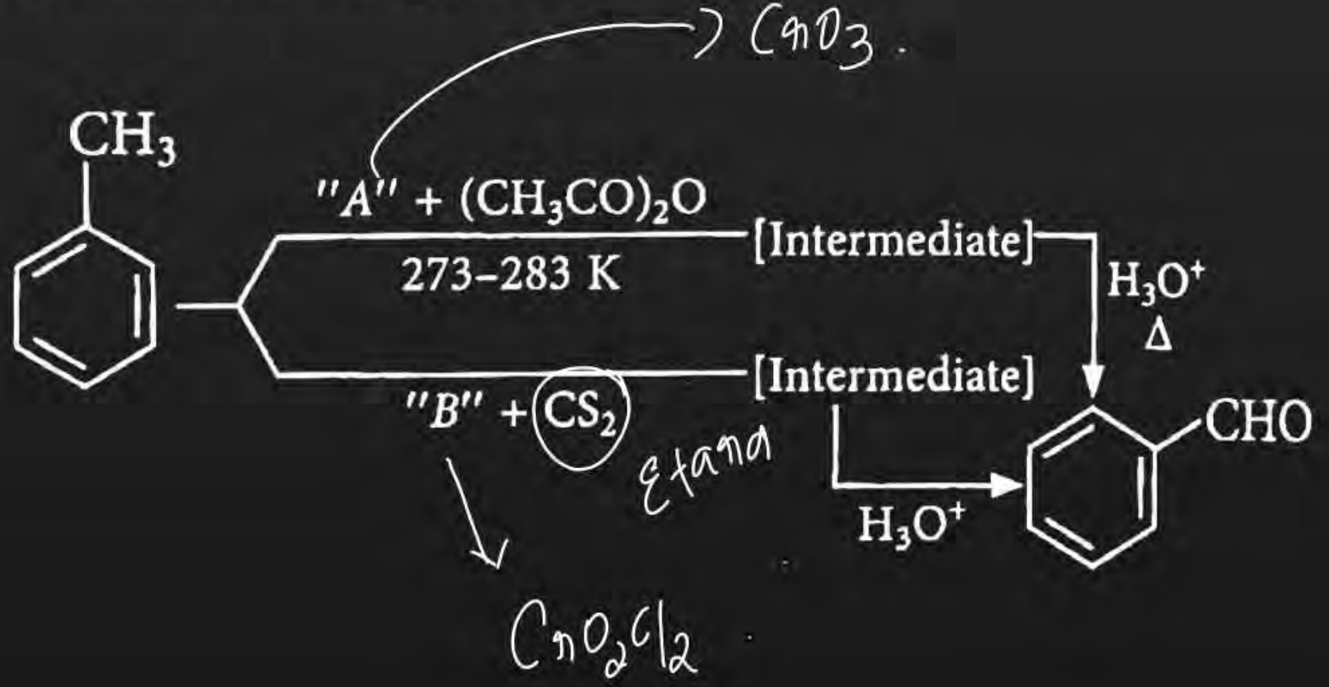
(B) $A =$  , $B =$ 

(C) $A =$  , $B =$ 

(D) $A =$  , $B =$ 

Question

In the given reactions, identify the reagent A and reagent B.



(A) A - CrO_3; B – CrO_2Cl_2

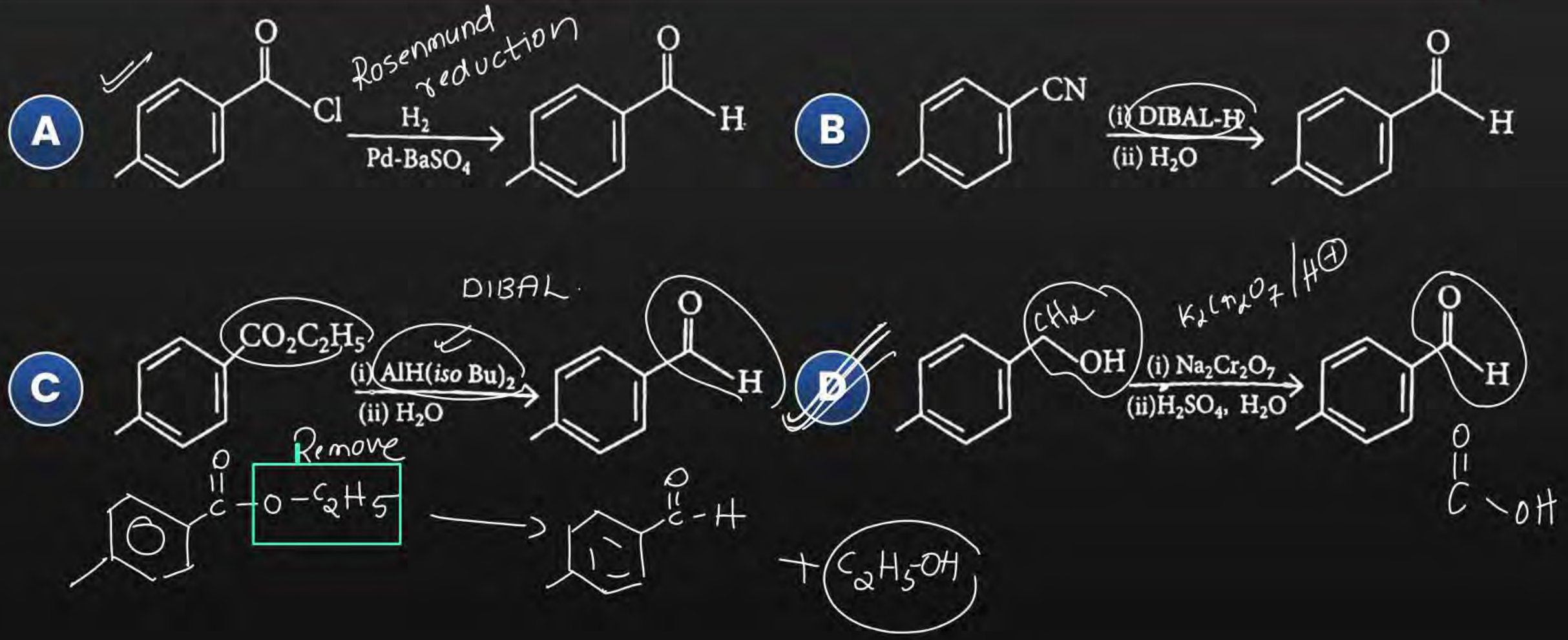
(B) A – CrO_2Cl_2; B – CrO_3

(C) A – CrO_3; B – CrO_3

(D) A – CrO_2Cl_2; B – CrO_2Cl_2

Question

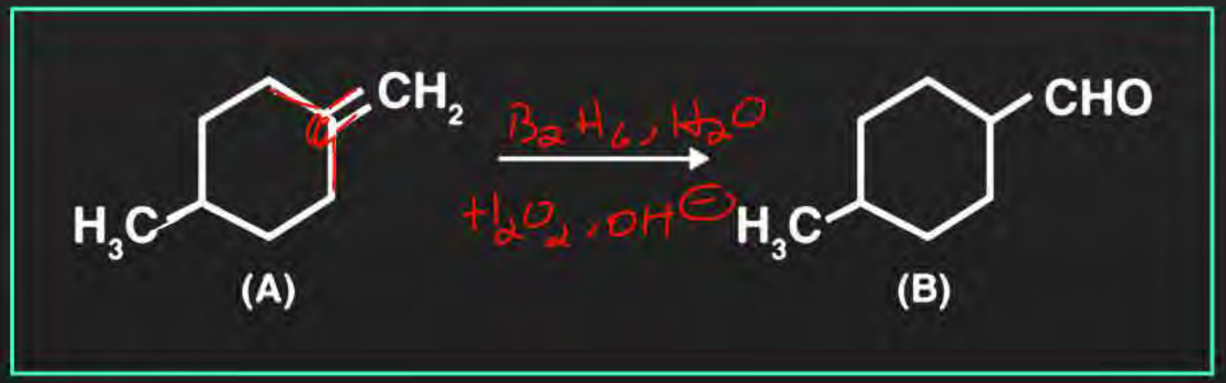
Which one of the following reactions does not represent correct combination of substrate and product under the given conditions?



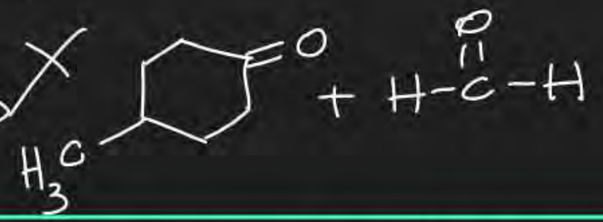
Question

5000

Which of the following reagents/reactions will convert ' A ' to ' B '?

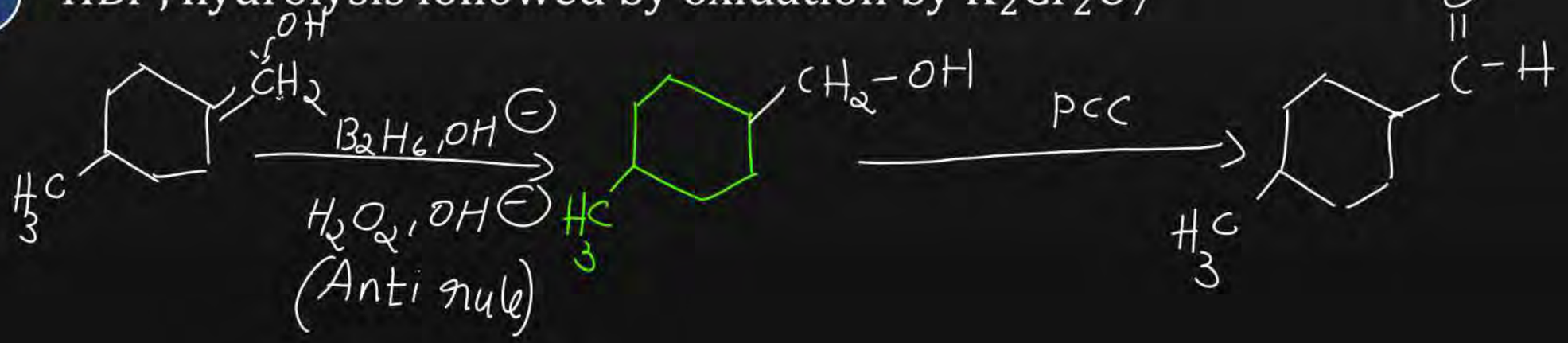


(A) PCC oxidation ✗ $CH_2OH \rightarrow CHO$

(B) Ozonolysis → ✗ 

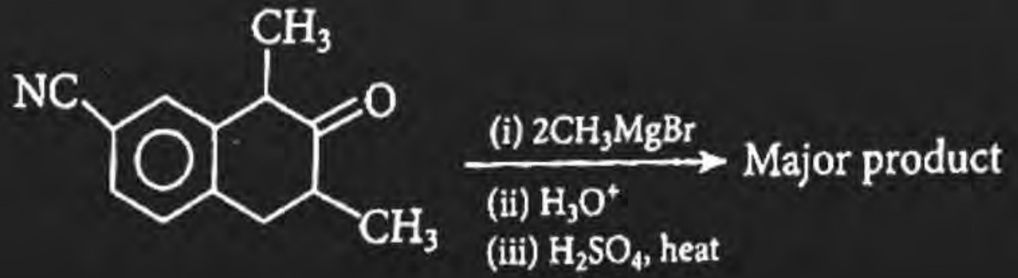
(C) $BH_3, H_2O_2/OH^-$ followed by PCC oxidation

(D) HBr , hydrolysis followed by oxidation by $K_2Cr_2O_7$

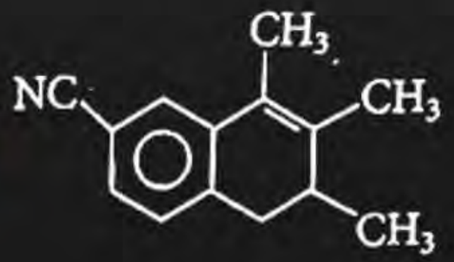


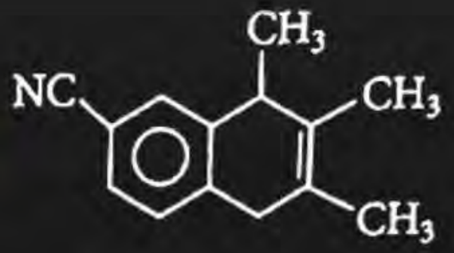
Question

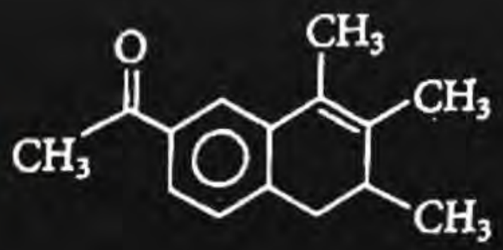
Which one of the following is the major product of the given reaction?

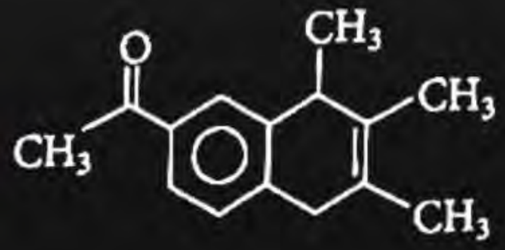


Homework

(A) 

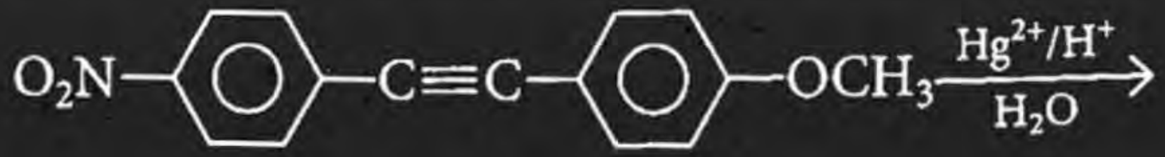
(B) 

(C) 

(D) 

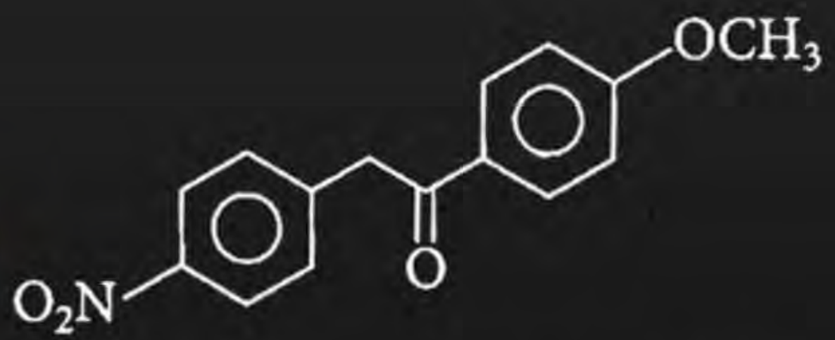
Question

The major product obtained from the following reaction is

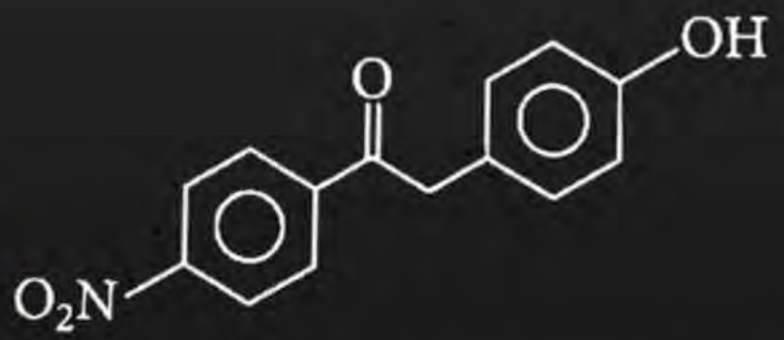


Homework

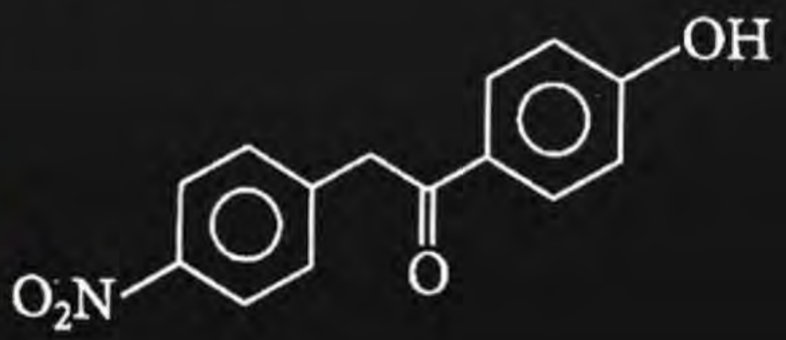
A



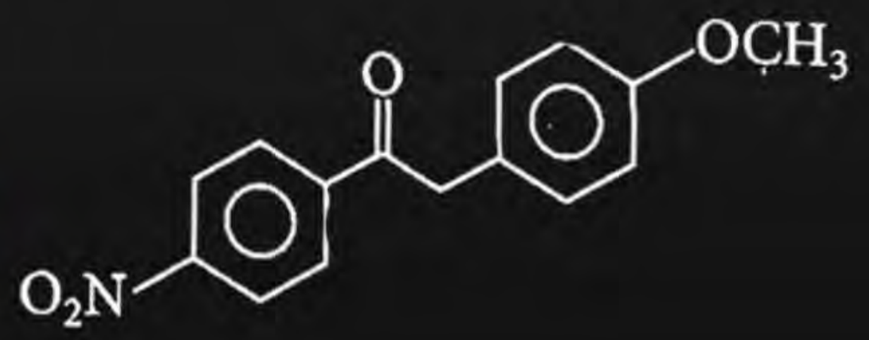
B



C

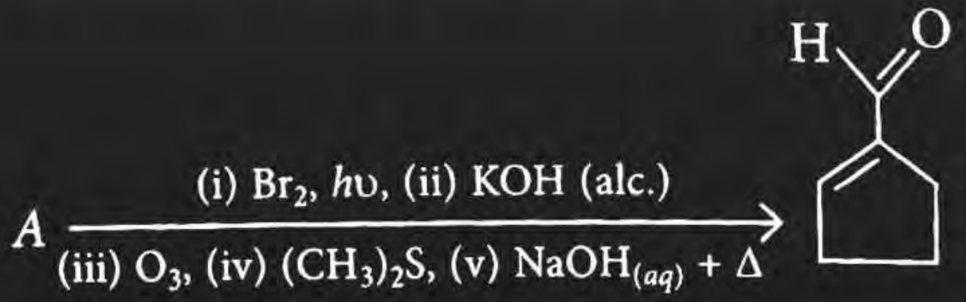


D



Question

In the following reaction A is



Homework

(A) 

(B) 

(C) 

(D) 

Question

The correct match between Item-I (starting material) and Item-II (reagent) for the preparation of benzaldehyde is

Item-I		Item-II	
(I)	Benzene (R)	(P)	HCl and $SnCl_2$, H_3O^+
(II)	Benzonitrile (P)	(Q)	H_2, Pd – $BaSO_4$, S and quinoline
(III)	Benzoyl chloride (Q)	(R)	CO, HCl and $AlCl_3$

A (I)-(Q), (II)-(R) and (III)-(P)

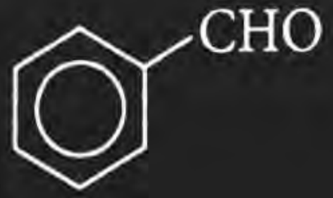
B (I)-(P), (II)-(Q) and (III)-(R)

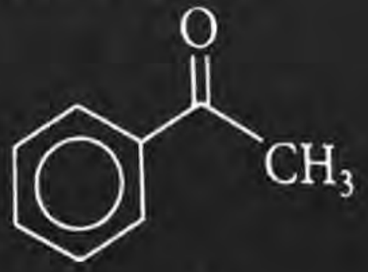
C (I)-(R), (II)-(P) and (III)-(Q)

D (I)-(R), (II)-(Q) and (III)-(P)

Question

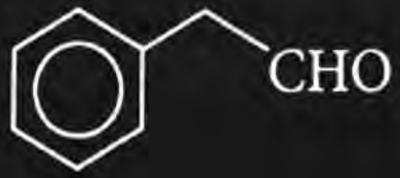
The compounds which give positive Fehling's test are:

(A) 

(B) 

(C) $HOCH_2 - CO - (CHOH)_3 - CH_2 - OH$

(D) 

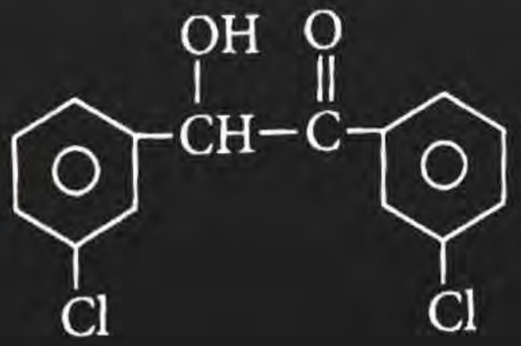
(D) 

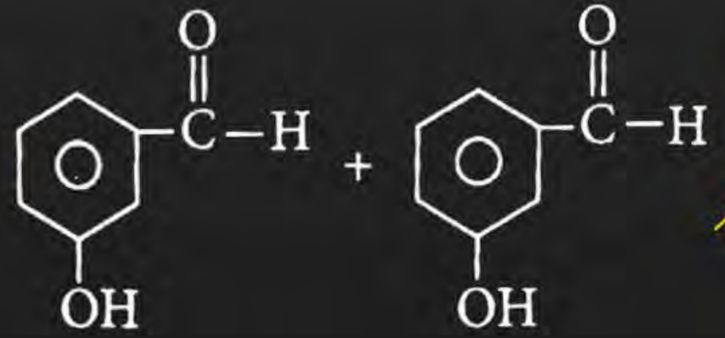
Choose the correct answer from the options given below:

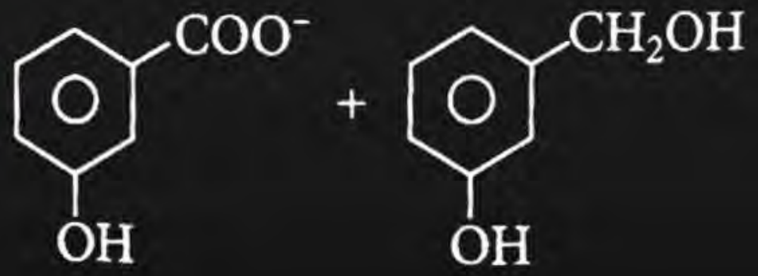
Question

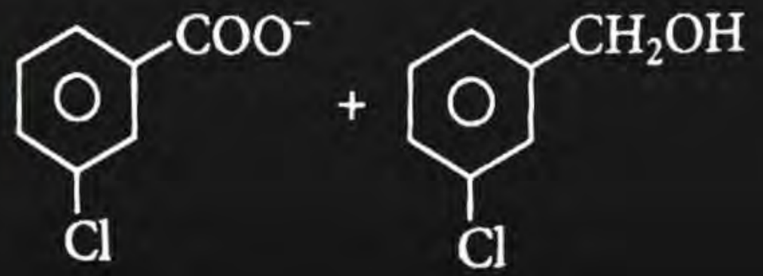
m-Chlorobenzaldehyde on treatment with 50% KOH solution yields

Homework

A 

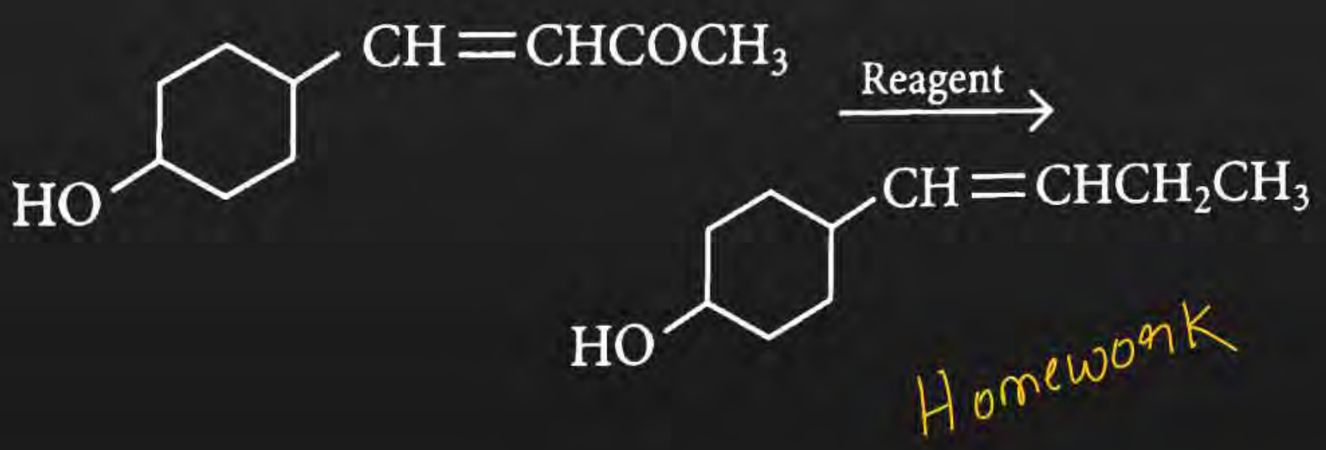
B 

C 

D 

Question

In the given transformation, which of the following is the most appropriate reagent?



Homework

(A) Zn-Hg/HCl

(B) Na, liq. NH_3

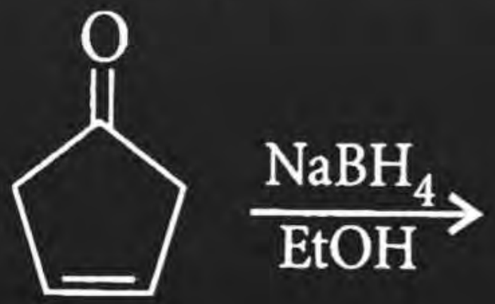
(C) $NaBH_4$

(D) $NH_2 - NH_2, OH^-$

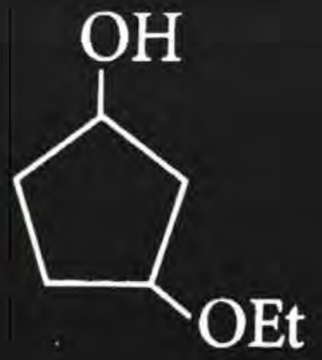
Question

Homework

The major product of the following reaction is



A 

B 

C 

D 

Synopsis — Amines.

Methods of Preparation of Amines

- R–NC + LiAlH4 (Isocyanide)
- From nitrobenzene
- NH_3 + R–X (Ammonolysis)
- Hoffmann degradation reaction
- Gabriel phthalimide
- Amide + LiAlH4

$R-N\equiv C \xrightarrow{LiAlH_4} R-NH-CH_3$ (2° amine)

$C_6H_5NO_2 \xrightarrow{Fe+HCl \text{ or } Sn+HCl} C_6H_5NH_2$

$\xrightarrow{Pd/H_2}$

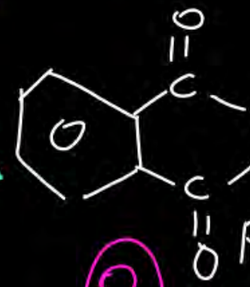
$\xrightarrow{Na+C_2H_5OH}$

Note: $LiAlH_4$ can not be used for nitrobenzene

$NH_3 + R-X \rightarrow R-NH_2$, 2° amine + 3° amine + 4° ammonium salt

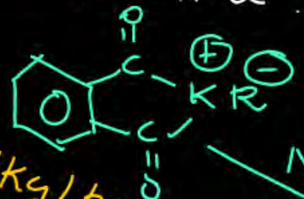
$R-\overset{O}{\overset{\|}{C}}-NH_2 \xrightarrow{NaOH+Br_2} R-NH_2 + NaBr + Na_2CO_3 + H_2O$

1° amine



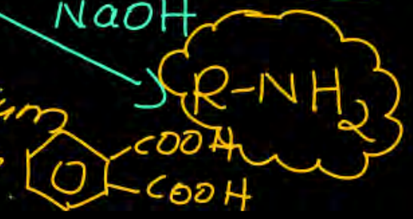
phthalimide

$\xrightarrow{KOH, RX}$



alkyl potassium phthalimide

$\xrightarrow{NaOH}$



$R-\overset{O}{\overset{\|}{C}}-NH_2 \xrightarrow{LiAlH_4} R-CH_2-NH_2$ amine

Thank you