

Aldehyde and Ketone

Question1

Oxidation of Toluene with chromyl chloride followed by hydrolysis gives Benzaldehyde. This reaction is known as _____

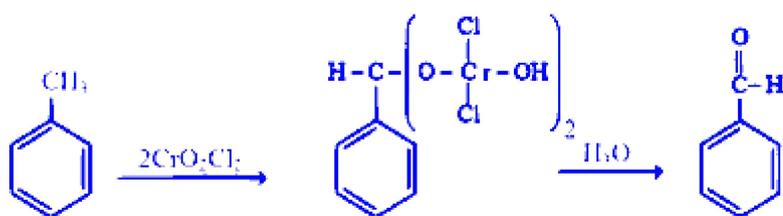
KCET 2025

Options:

- A. Etard Reaction
- B. Kolbe reaction
- C. Stephen reaction
- D. Cannizzaro Reaction

Answer: A

Solution:



Question2

Arrange the following compounds in their decreasing order of reactivity towards Nucleop addition reaction.





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Options:



Answer: A

Solution:

In considering the reactivity of compounds towards nucleophilic addition reactions, two primary factors need to be evaluated: the positive character of the electrophilic center and the degree of steric hindrance.

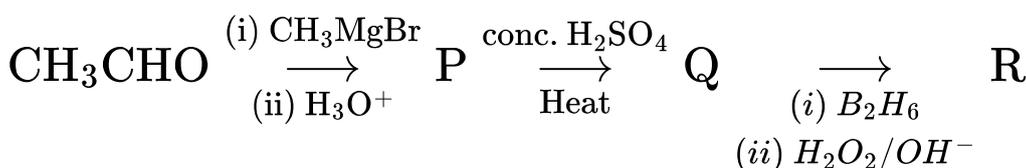
Electrophilic Character: The more positive the electrophilic center, the more reactive it is towards a nucleophile. This is typically observed in aldehydes, where the electron-withdrawing effect of the carbonyl group is not counterbalanced by additional alkyl groups.

Steric Hindrance: As steric hindrance increases, reactivity decreases. Larger substituents around the electrophilic center can block the approach of the nucleophile, thus lowering the reaction rate.

Given these considerations, aldehydes are generally more reactive than ketones due to less steric hindrance and a higher degree of positive charge on the carbonyl carbon. Between ketones, those with smaller alkyl groups are usually more reactive. Evaluate each compound based on these criteria to determine their relative reactivity in nucleophilic addition reactions.

Question3

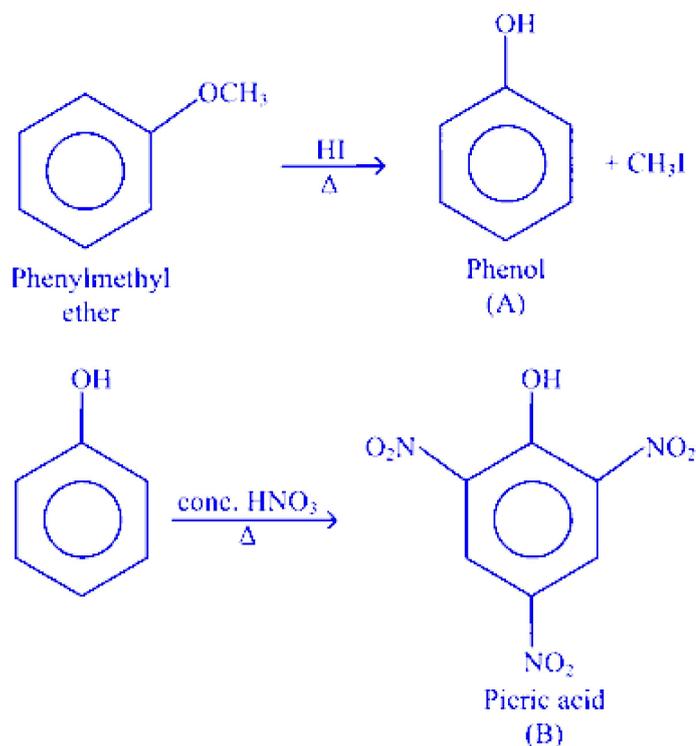
Compounds P and R in the following reaction are



D. phenol, picric acid

Answer: D

Solution:



Thus, the compound (A) and (B) are phenol and picric acid respectively.

Question5

The general name of the compound formed by the reaction between aldehyde and alcohol is

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Options:

A. acetal

B. glycol

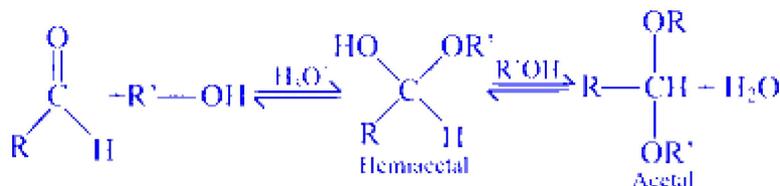
C. acetate

D. ester

Answer: A

Solution:

The general name of the compound formed by the reaction between aldehyde and alcohol is acetal. e.g.



Question6

The test to differentiate between pentan-2-one and pentan-3-one is

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Options:

A. Benedict's test

B. Fehling's test

C. Iodoform test

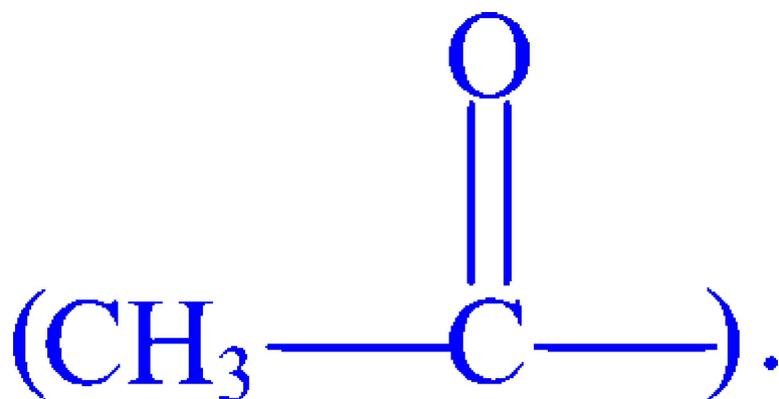
D. Baeyer's test

Answer: C

Solution:

Pentan-2-one gives positive iodoform test when react with NaOH and I₂ and form yellow precipitates of iodoform. While pentan-3-one does not gives positive iodoform test. The involved reactions given below :

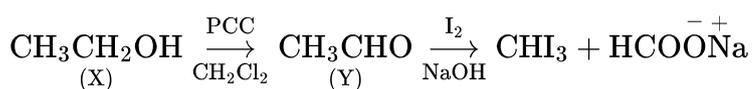




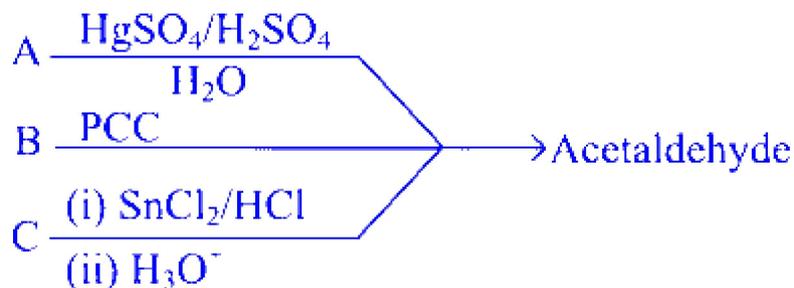
PCC is an oxidising agent which oxidised the alcohol to aldehyde or ketone (depends upon the reactant alcohol). That means X is an alcohol.

From the given information, it is concluded that the compound X is an alcohol (which contain two carbon). Thus, the alcohol is $\text{CH}_3\text{CH}_2\text{OH}$.

The reaction involves are as follows :



Question8



A , B and C respectively are

KCET 2021

Options:

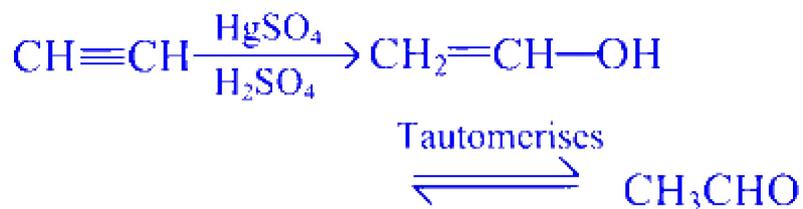
- A. ethanol, ethane nitrile and ethyne
- B. ethane nitrile, ethanol and ethyne
- C. ethyne, ethanol and ethane nitrile
- D. ethyne, ethane nitrile and ethanol



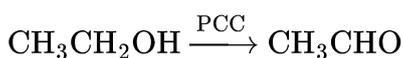
Answer: C

Solution:

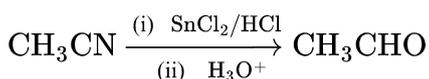
Ethyne on reaction with $\text{HgSO}_4/\text{H}_2\text{SO}_4$ gives ethanol (i.e. $\text{CH}_2 = \text{CH} - \text{OH}$) which interconvert (i.e. tautomerises) to give acetaldehyde (CH_3CHO).



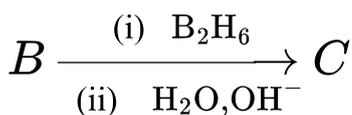
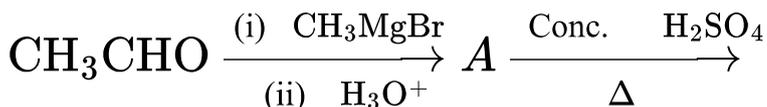
PCC is an oxidising agent, which oxidised the alcohol to aldehyde. Therefore, (*B*) is an alcohol, i.e. ethanol.



Ethane nitrile on reaction with SnCl_2/HCl followed by acid hydrolysis give acetaldehyde.



Question9



A and C are

KCET 2021

Options:

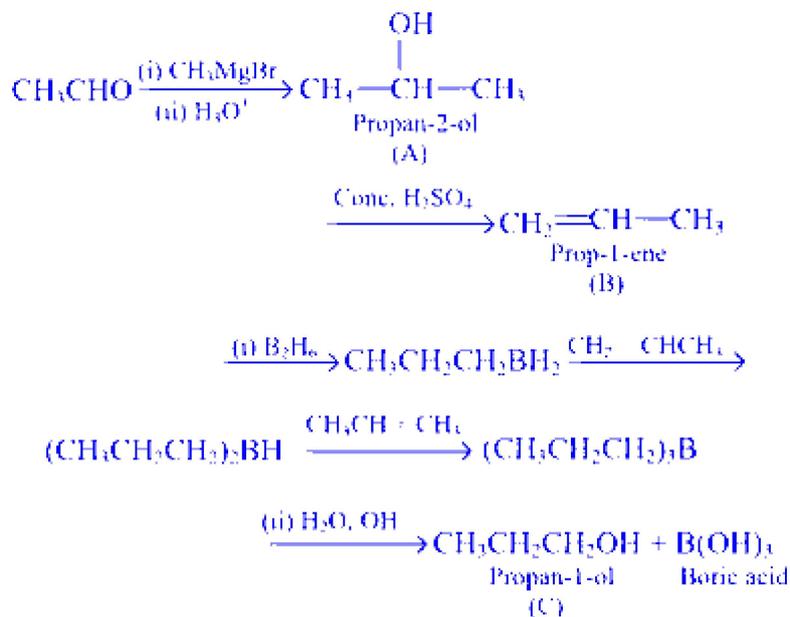
- A. Identical
- B. Position isomers
- C. Functional

D. Optical isomers

Answer: B

Solution:

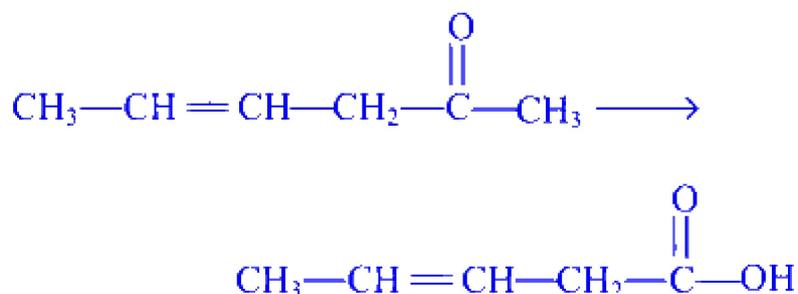
The complete given reaction is as follows



In compounds (A) and (C) only the position of $-\text{OH}$ group is changed. Thus, compounds A and C are position isomers.

Question10

Which is the most suitable reagent for the following conversion?



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Options:

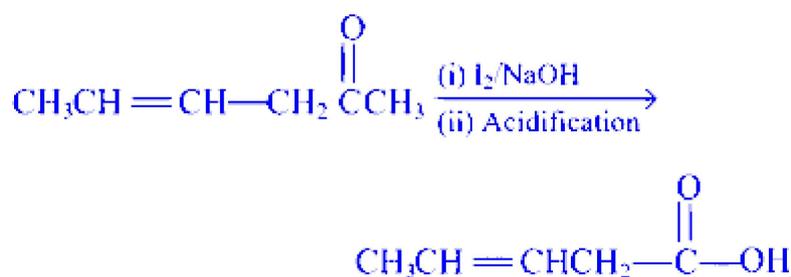


- A. Tollen's reagent
- B. Benzoyl peroxide
- C. I₂ and NaOH solution with subsequent acidification
- D. Sn and NaOH solution

Answer: C

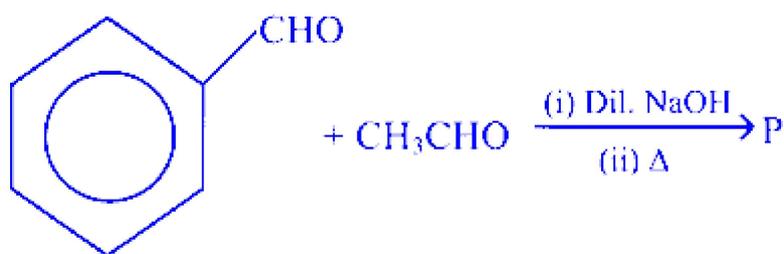
Solution:

In the given reaction $-\text{COCH}_3$ group gets oxidised to $-\text{COOH}$ without affecting the double bond. This could occur when we use I₂ and NaOH solution with subsequent acidification. This reaction is known as iodoform reaction. The overall reaction is as follows



Question11

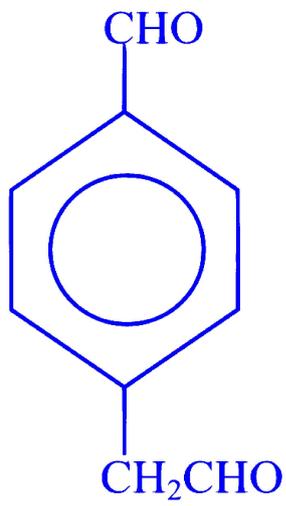
The product 'P' is



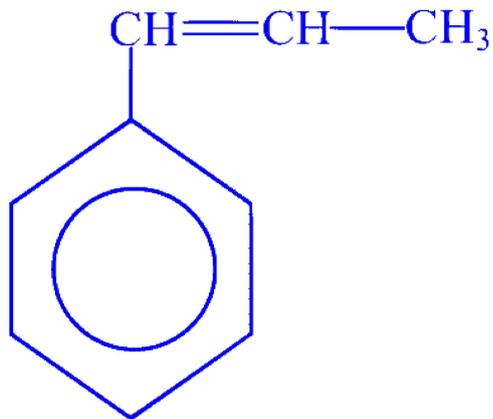
KCET 2020

Options:

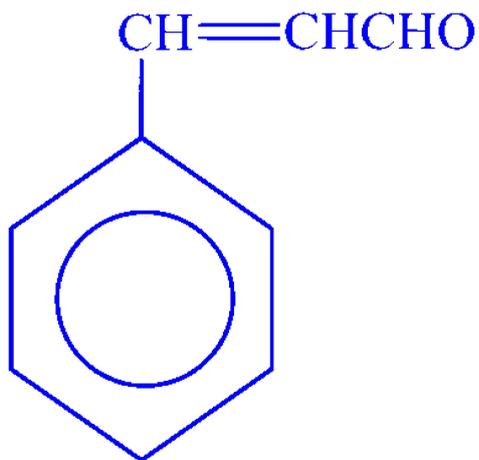
A.



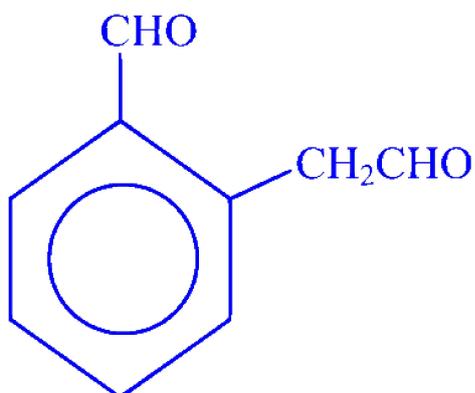
B.



C.

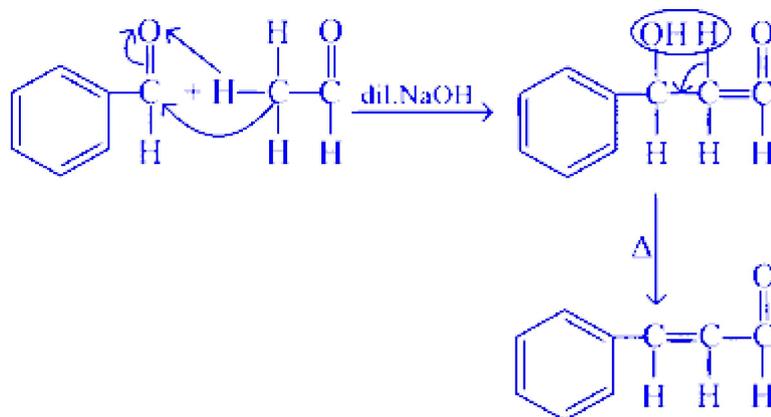


D.



Answer: C

Solution:



Here, aldol condensation reaction is taking place.

Question12

The carbonyl compound that does not undergo aldol condensation is

KCET 2020

Options:

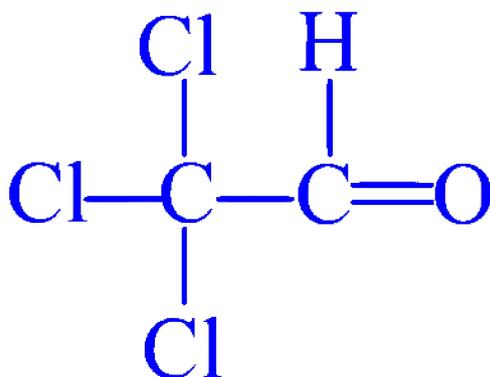
- A. acetone
- B. dichloro acetaldehyde
- C. trichloro acetaldehyde
- D. acetaldehyde

Answer: C

Solution:

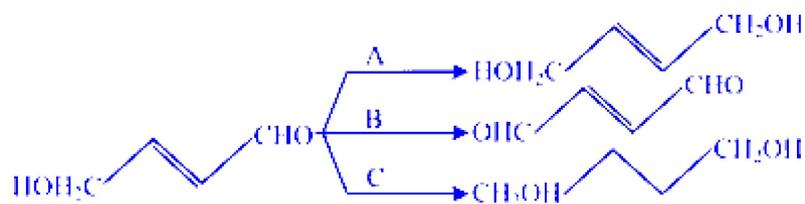
Any carbonyl compound having α -hydrogen will undergo aldol condensation.

In



there is no α -hydrogen on trichloro acetaldehyde and hence, it will not show aldol condensation reaction.

Question13



The reagents *A*, *B* and *C* respectively are

KCET 2019



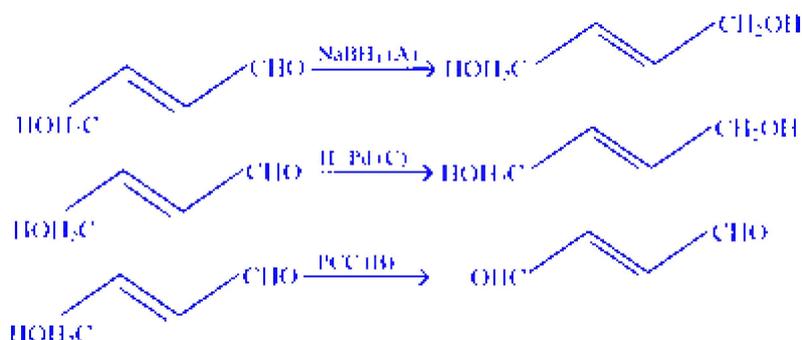
Options:

- A. H_2/Pd , PCC, NaBH_4
- B. NaBH_4 , alk, KMnO_4 , H_2/Pd
- C. NaBH_4 , PCC, H_2/Pd
- D. H_2/Pd , alk, KMnO_4 , NaBH_4

Answer: C

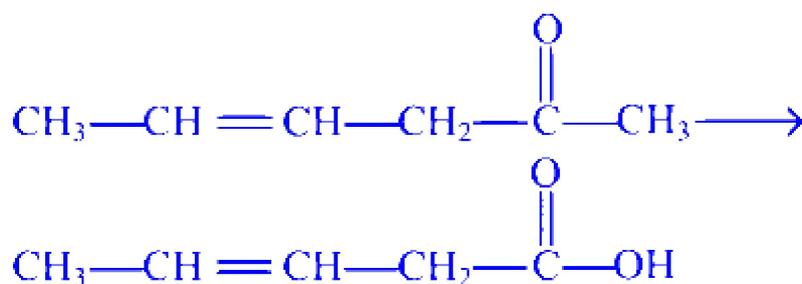
Solution:

NaBH_4 reagent is selectively used to reduce carbonyl group. PCC reagent is used to oxidise -OH group to -CHO group. H_2 , Pd/C can reduce double bonds and functional groups also. Aldehydes are reduced to the corresponding alcohols by addition of hydrogen in the presence of catalysts (catalytic hydrogenation). The usual catalyst is a finely divided metal such as palladium i.e. H_2/Pd . It also reduces double bonds. Aldehydes also get reduced to alcohols using sodium borohydride (NaBH_4). It selectively reduces -CHO to -OH. PCC (Pyridinium chloro (chromate) having molecular formula $[\text{C}_3\text{H}_5\text{NH}]^{\oplus}[\text{CrO}_3\text{Cl}]^{\ominus}$ is a mild reagent used primarily for the oxidation of alcohols to form carbonyls. It stops the reaction at the aldehydic stage. Reactions are as follows



Question 14

Which is the most suitable reagent for the following conversion?



KCET 2019

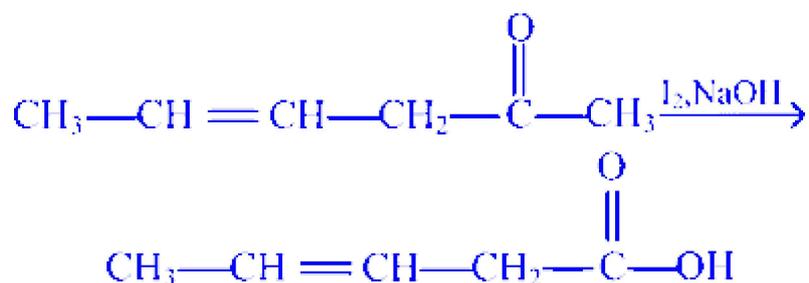
Options:

- A. Tollen's reagent
- B. I_2 and NaOH solution
- C. Benzoyl peroxide
- D. Sn and NaOH solution

Answer: B

Solution:

The most suitable reagent for the given conversion is I_2 and NaOH solution.



This reaction is called iodoform reaction. Here, the carbonyl carbon atom is oxidised by sodium hypiodide to sodium salts of corresponding carboxylic acids having one carbon atom less than that of carbonyl compound.

Question15

Which of the following compounds undergoes haloform reaction?

KCET 2018

Options:

- A. CH_3COCH_3
- B. HCHO
- C. $\text{CH}_3\text{CH}_2\text{Br}$
- D. $\text{CH}_3 - \text{O} - \text{CH}_3$



Answer: A

Solution:

The haloform reaction occurs when a compound contains a methyl ketone group (CH_3COR) or converts into one during the reaction. Here's a quick breakdown of each option:



This is acetone, which is a methyl ketone. It has a CH_3 group directly connected to the carbonyl group.

Under basic conditions with a halogen, the methyl group is transformed into a trihalomethyl group, which is then cleaved off as a haloform.

Thus, acetone undergoes the haloform reaction.



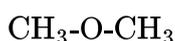
This is formaldehyde. It lacks the necessary CH_3 group adjacent to the carbonyl (in fact, it doesn't have a methyl group at all).

Therefore, it does not undergo the haloform reaction.



This compound is bromoethane, an alkyl halide without a carbonyl group.

It does not have the structure required for the haloform reaction.



This is dimethyl ether, which is an ether and not a ketone.

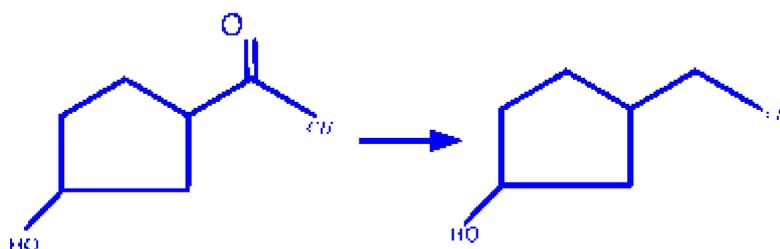
It does not undergo the haloform reaction.

Based on this analysis, the only compound that undergoes the haloform reaction is:

Option A: CH_3COCH_3 .

Question 16

The appropriate reagent for the following transformation is



KCET 2018

Options:

- A. Zn – Hg/HCl
- B. $\text{H}_2\text{N} - \text{NH}_2$, KOH/ethylene glycol
- C. Ni/ H_2
- D. NaBH_4

Answer: B

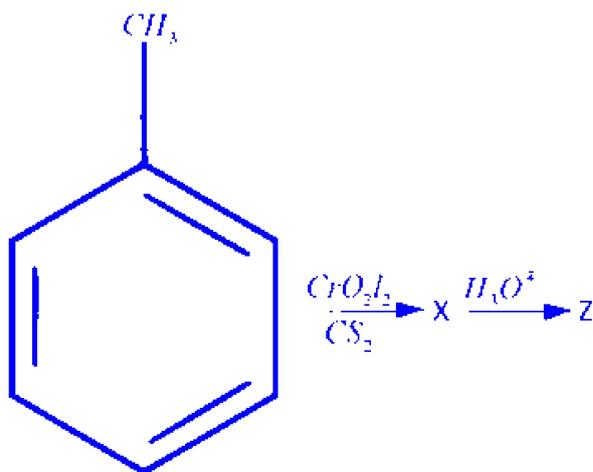
Solution:

The given reaction is an example of Wolff-Kishner reaction in which aldehyde/ketone group reduce to alkane ($-\text{CH}_2$) in the presence of $\text{H}_2\text{N} - \text{NH}_2$, KOH/ ethylene glycol.

\therefore (b) is the correct option.

Question17

In the following reaction,



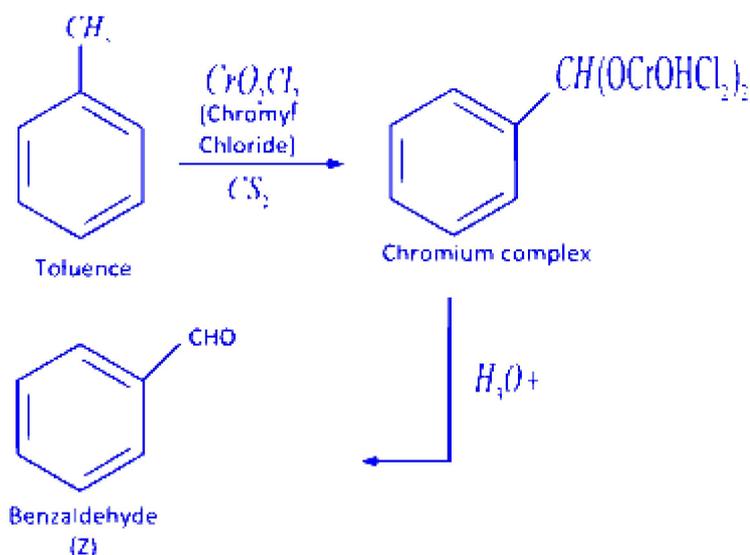
KCET 2018

Options:

- A. benzoic acid
- B. benzaldehyde
- C. acetophenone
- D. benzene

Answer: B

Solution:



(This reaction is Etard reaction)

In this reaction Z is benzaldehyde.

Question18

Reduction of ketones cannot be carried out with which of the following reagents?

KCET 2017

Options:

- A. Sodium borohydride or lithium aluminium hydride



B. Zinc amalgam and conc. HCl

C. Hydrazine and KOH in ethylene glycol

D. Hydrogen in presence of palladium in barium sulphate and quinoline

Answer: D

Solution:

Let's analyze each option:

Option A – NaBH_4 and LiAlH_4

- Both sodium borohydride and lithium aluminum hydride are common reducing agents for ketones.
- They reduce ketones by nucleophilic attack on the carbonyl carbon to form secondary alcohols.

Option B – Zinc amalgam and conc. HCl

• This combination is used in the Clemmensen reduction, which converts ketones (and aldehydes) into alkanes under acidic conditions.

Option C – Hydrazine and KOH in ethylene glycol

• This mixture is used in the Wolff–Kishner reduction, another method to reduce ketones to alkanes under strongly basic conditions at high temperature.

Option D – Hydrogen in the presence of palladium on barium sulfate and quinoline

• This is a poisoned catalyst (similar to the Lindlar catalyst) primarily used for the selective hydrogenation of alkynes to alkenes.

- Under these conditions, ketones are not reduced.

Thus, ketones cannot be reduced by the reagent listed in Option D.

Question 19

Cannizzaro's reaction is an example of auto oxidation

KCET 2017

Options:

A. It is a reaction answered by only aldehydes containing a hydrogen.

B. It is a reaction answered only by aromatic aldehydes.

C. It is a reaction answered by all aldehydes.



D. It is a typical reaction of aliphatic aldehyde.

Answer: B

Solution:

Aldehyde which do not contain α -hydrogens on treatment with conc. alkali undergo disproportionation i.e. self oxidation.

