One Two academy | Carbonyl Compounds and Carboxylic acids

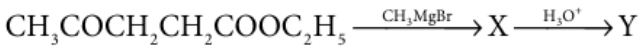
Maximum Mark: 25 **Chemistry** **Time: 50 minutes**

Choose the correct answer: **3 x 1 = 3**

1. Carboxylic acids have higher boiling points than aldehydes, ketones and even alcohols of comparable molecular mass. It is due to their
   a) more extensive association of carboxylic acid via vanderWaals force of attraction
   b) formation of carboxylate ion
   c) formation of intramolecular H-bonding
   d) formation of intermolecular H – bonding
2. Which of the following reduces Tollen's reagent?
   a) Formic acid b) Acetic acid c) Benzophenone d) None of these
3. **Assertion:** p – N, N – dimethyl amino benzaldehyde undergoes benzoin condensation.
   Reason: The aldehydic (-CHO) group is meta directing

Answer Any four of the following: **4 x 2 = 8**

4. Identify X and Y



$$CH_3COCH_2CH_2COOC_2H_5 \xrightarrow{CH_3MgBr} X \xrightarrow{H_3O^+} Y$$

5. What is Clemmensen reduction?
6. Mention the uses of urotropine.
7. Explain the mechanism of esterification.
8. How will you prepare Lactic acid from ethanal

Answer any three of the following: **3 x 3 = 9**

9. An alkene (A) on ozonolysis gives propanone and aldehyde (B). When (B) is oxidised (C) is obtained. (C) is treated with Br_2/P gives (D) which on hydrolysis gives (E). When propanone is treated with HCN followed by hydrolysis gives (E). Identify A, B, C, D and E.
10. Explain Benzoin condensation.
11. Explain the reducing action of formic acid with example.
12. Oxidation of ketones involves carbon – carbon bond cleavage. Name the product (s) is / are formed on oxidising 2,5 – dimethyhexan – 3- one using strong oxidising agent.

Answer the following: **1 x 5 = 5**

13. a) Explain (i) Perkins reaction (ii) Knoevenagal reaction.

(Or)

b) A Compound (A) with molecular formula C_2H_3N on acid hydrolysis gives(B) which reacts with thionyl chloride to give compound(C). Benzene reacts with compound (C) in presence of anhydrous AlCl3 to give compound(D). Compound (D) on reduction with Zn/Hg and Conc. HCl gives (E). Identify (A), (B), (C), (D) and (E). Write the equations.

All the Best

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Answer Key attached in the next page !!!

This page is to prevent seeing answer key

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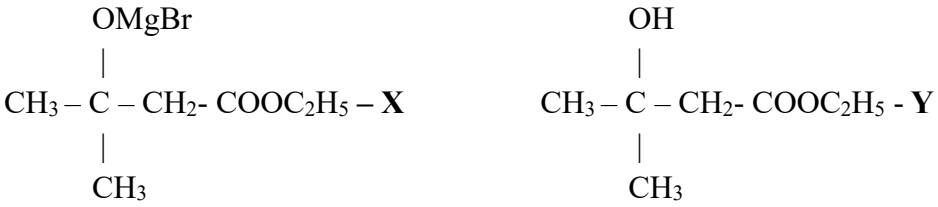
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Answer Key

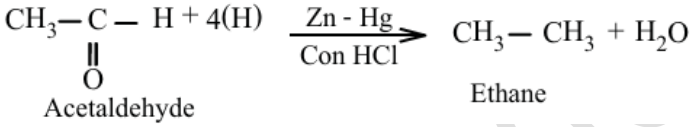
Choose the Correct answer:

1. – d) 2. – a) 3. – Both (A)and (R) are true but (R) does not explains (A)

Answer any four of the following:

4. 

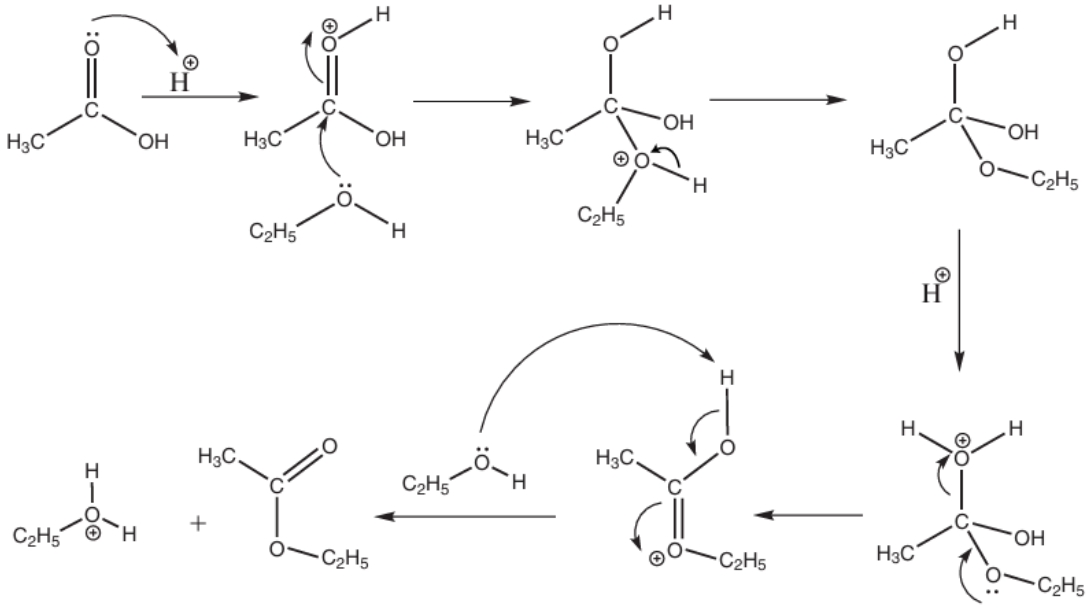
5. **Clemmensen reduction**: Aldehydes and Ketones when heated with zinc amalgam and concentrated hydrochloric acid gives hydrocarbons.



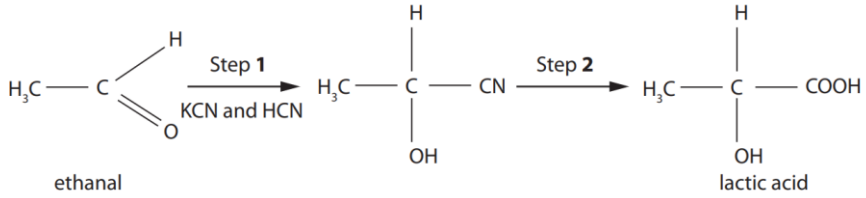
6. **Uses of urotropine:**
   i. Urotropine is used as a medicine to treat urinary infection.
   ii. Nitration of Urotropine under controlled condition gives an explosive RDX (Research and development explosive). It is also called cyclonite or cyclotri methylene trinitramine.

7. **Mechanism of esterification:**

The Mechanism of esterification involves the following steps.



8. Ethanal to Lactic acid



ethanal lactic acid

Answer any three of the following:

9.

1. 2-methyl-but-2-ene (A) on ozonolysis gives propanone and acetaldehyde (B)

$$\underset{\text{(2-methyl–but-2-ene)}}{\underset{\text{(A)}}{CH_3-CH=\overset{\overset{CH_3}{|}}{C}-CH_3}} \xrightarrow[Zn/H_2O]{O_3} \underset{\text{(Acetaldehyde)}}{\underset{\text{(B)}}{CH_3CHO}} + \underset{\text{(Propanone)}}{CH_3-\overset{\overset{O}{||}}{C}-CH_3}$$

2. Acetaldehyde (B) is oxidised to give acetic acid (C), which on further treated with Br_2/P give monobromo acetyl bromide (D) which on hydrolysis gives monobromo acetic acid (E).

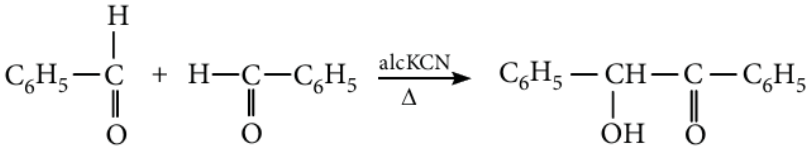
$$\underset{\text{(Acetaldehyde)}}{\underset{\text{(B)}}{CH_3CHO}} \xrightarrow[\text{(O)}]{H^+/K_2Cr_2O_7} \underset{\text{(Acetic acid)}}{\underset{\text{(C)}}{CH_3COOH}} \xrightarrow[\text{Excess}]{Br_2/P} \underset{\text{(Monobromo acetyl bromide)}}{\underset{\text{(D)}}{CH_2(\overset{\overset{Br}{|}}{C})OBr}}$$

3. Propanone is treated with HCN followed by hydrolysis to gives 2-methyl-2-hydorxy propanoic acid (E)

$$\underset{\text{(Propanone)}}{CH_3-\overset{\overset{O}{||}}{C}-CH_3} \xrightarrow[\text{(ii) } H^+/H_2O]{\text{(i) HCN}} \underset{\text{(2-methyl-2-hydorxy propanoic acid)}}{\underset{\text{(E)}}{CH_3-\overset{\overset{OH}{|}}{C}-CH_3}}$$

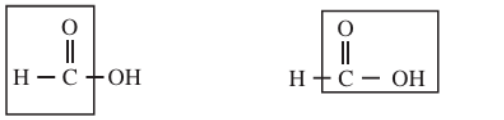
A	$CH_3-CH=\overset{\overset{CH}{|}}{C}-CH_3$	2-methyl-but-2-ene
B	CH_3CHO	Acetaldehyde
C	CH_3COOH	Acetic acid
D	$Br-CH_2-COBr$	Monobromo acetyl bromide
E	$CH_3C(OH)(COOH)CH_3$	2-methyl-2-hydorxy propanoic acid

10. **Benzoin condensation:** Benzoin condensation involves the treatment of an aromatic aldehyde with aqueous alcoholic KCN. The products are **α** hydroxy ketone.
Example: Benzaldehyde reacts with alcoholic KCN to form benzoin



Benzaldehyde — Benzoin (2-hydroxy – 1, 2 – diphenyl ethanone)

11. **Reducing action of formic acid:** Formic acid contains both an aldehyde as well as an acid group. Hence, like other aldehydes, formic acid can easily be oxidised and therefore acts as a strong reducing agent.



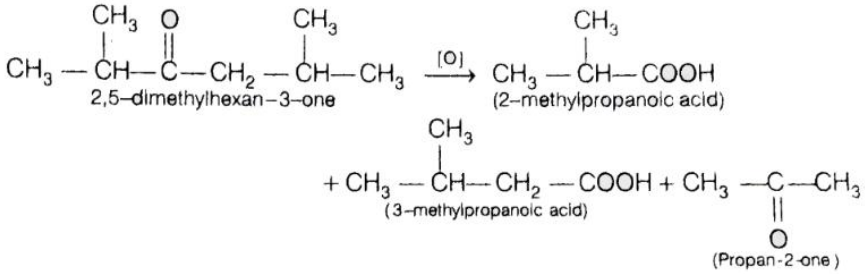
Aldehyde group — Carboxylic acid group

i) Formic acid reduces Tollen's reagent (ammonical silver nitrate solution) to metallic silver.



(Tollens reagent) — Silver mirror

12. Popoff's rule states that during the oxidation of an unsymmetrical ketone with oxidaising agent which brings about the cleavage of (C–C), the smaller alkyl groups goes preferentially with the carbonyl group resulting in the carboxylic acids.



2,5–dimethylhexan–3–one → (2–methylpropanoic acid) + (3–methylpropanoic acid) + (Propan-2-one)

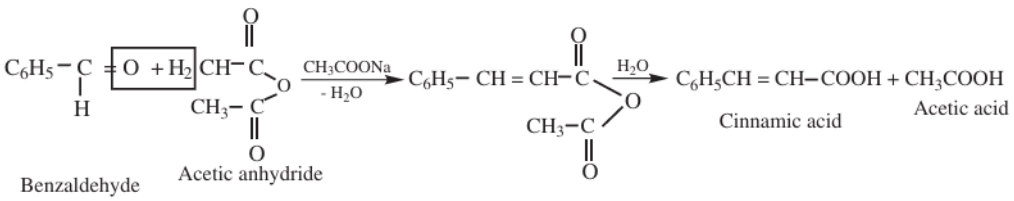
Answer the following:

13. a)

(i) Perkins reaction:

When an aromatic aldehyde is heated with an aliphatic acid anhydride in the presence of the sodium salt of the acid corresponding to the anhydride, condensation takes place and an α, β unsaturated acid is obtained. This reaction is known as Perkin's reaction.

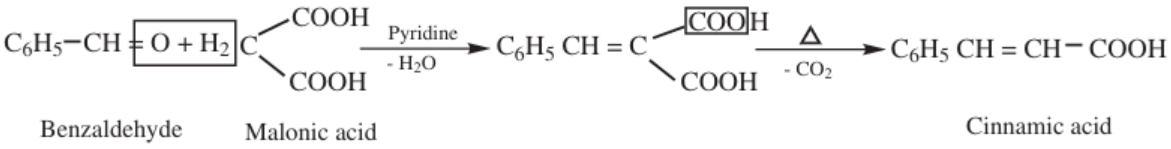
Example:



Benzaldehyde — Acetic anhydride — Cinnamic acid — Acetic acid

(ii) Knoevenagal reaction:

Benzaldehyde condenses with malonic acid in presence of pyridine forming cinnamic acid, Pyridine act as the basic catalyst.



(OR)

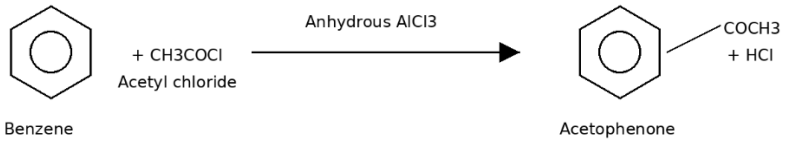
b) Compound (A) C2H3N on acid hydrolysis gives CH_3-COOH (B)

$$\underset{\text{(Methyl cyanide)}}{\underset{\text{(A)}}{CH_3CN}} \xrightarrow[\text{excess}]{H^+/H_2O} \underset{\text{(Acetic acid)}}{\underset{\text{(B)}}{CH_3COOH}}$$

Acetic acid reacts with thionyl chloride gives acetyl chloride

$$\underset{\text{(Acetic acid)}}{\underset{\text{(B)}}{CH_3COOH}} \xrightarrow{SOCl_2} \underset{\text{(Acetyl chloride)}}{\underset{\text{(C)}}{CH_3COCl}} + SO_2 + HCl$$

Benzene reacts with acetyl chloride in the presence of $AlCl_3$ give Aceto phenone



A	CH_3CN	Methyl cyanide
B	CH_3COOH	Acetic acid
C	CH_3COCl	Acetyl chloride
D		Acetophenone
E	CH_3CHO	Acetaldehyde