UP Board Class 12 CHEMISTRY SET GD Question Paper with Solutions

Time Allowed :3 Hour 15 Minutes	**Maximum Marks :**70	**Total Questions :**33

General Instructions

Read the following instructions very carefully and strictly follow them:

1. First 15 minutes are allotted for the candidates to read the question paper.
2. **A**ll questions are compulsory. Marks allotted to each question are given against it.
3. Give relevant answers to the questions.
4. Give chemical equations, wherever necessary.

1.
Four alternatives are given in each part of this question. Select the correct alternative and write it in your answer-book:
(a) Which of the following has lowest osmotic pressure?
(i) Potassium chloride solution

(ii) Gold solution

(iii) Magnesium chloride solution

(iv) Aluminium phosphate solution

Correct Answer: (ii) Gold solution
Solution:
Step 1: Osmotic pressure is directly proportional to the number of dissolved particles in a solution.
Electrolytes dissociate into multiple ions, increasing the number of solute particles in solution. Gold solution is a colloidal solution and has the lowest osmotic pressure as it contains fewer dissolved ions compared to ionic compounds like potassium chloride or magnesium chloride.

Quick Tip

Osmotic pressure follows the relation $\pi = iMRT$, where i is the van't Hoff factor, representing the number of particles a solute dissociates into.

(b) Among the following, which is more acidic?
(i) H_2O

(ii) C_6H_5OH

(iii) C_2H_5OH

(iv) CH_3OCH_3

Correct Answer: (ii) C_6H_5OH (Phenol)
Solution:
Step 1: Acidity is determined by the stability of the conjugate base formed after losing a proton.
Phenol (C_6H_5OH) is more acidic than water and ethanol due to resonance stabilization of its conjugate base ($C_6H_5O^-$).
Ether (CH_3OCH_3) does not release protons easily and is least acidic.

Quick Tip

The acidity of organic compounds can be compared by evaluating the stability of their conjugate bases.

(c) Lucas reagent is
(i) conc. HCl + anhydrous $ZnCl_2$

(ii) $Pd + BaSO_4$

(iii) dil. HCl + anhydrous $ZnCl_2$

(iv) none of these

Correct Answer: (i) conc. HCl + anhydrous $ZnCl_2$
Solution:
Step 1: Lucas reagent is a solution of concentrated hydrochloric acid and anhydrous zinc chloride ($ZnCl_2$).
It is used to distinguish primary, secondary, and tertiary alcohols based on their reactivity in the Lucas test.
Tertiary alcohols react immediately, secondary alcohols show turbidity after some time, and primary alcohols do not react under normal conditions.

Quick Tip

Lucas reagent is used for classifying alcohols based on their reactivity with $ZnCl_2/HCl$, following the SN1 mechanism.

(d) Appropriate reagent used to distinguish between acetaldehyde and acetone is
(i) Hinsberg reagent

(ii) Schiff's reagent

(iii) Lucas reagent

(iv) none of these

Correct Answer: (ii) Schiff's reagent
Solution:
Step 1: Schiff's reagent is used to distinguish between aldehydes and ketones.
Aldehydes react with Schiff's reagent to give a pink color, whereas ketones do not react.
Since acetaldehyde is an aldehyde and acetone is a ketone, Schiff's reagent can differentiate between them.

> Quick Tip
>
> Schiff's reagent test is a qualitative test to detect aldehydes, giving a pink/magenta color due to the formation of a complex.

(e) Which of the following amines does not give carbylamine reaction?
(i) CH_3NH_2

(ii) $CH_3CH_2NH_2$

(iii) CH_3NHCH_3

(iv) $C_6H_5NH_2$

Correct Answer: (iii) CH_3NHCH_3
Solution:
Step 1: The carbylamine test is given by primary amines (both aliphatic and aromatic), but not by secondary or tertiary amines.
Step 2: CH_3NHCH_3 is a secondary amine, which does not give the carbylamine reaction.
All other options contain primary amines and will give a positive test.

> Quick Tip
>
> The carbylamine reaction is used to detect primary amines, where they react with chloroform and alcoholic KOH to form isocyanides with a foul odor.

(f) Deficiency of Vitamin A causes
(i) anaemia

(ii) skin disease

(iii) sterility

(iv) night blindness

Correct Answer: (iv) night blindness
Solution:
Step 1: Vitamin A is essential for vision, immune function, and cell growth.
Step 2: Its deficiency primarily leads to night blindness (nyctalopia), which affects the ability to see in low light conditions.
Other symptoms may include dry skin, weakened immunity, and delayed growth.

> Quick Tip
>
> Vitamin A plays a crucial role in vision by forming rhodopsin, a pigment needed for low-light vision.

2.
(a) At 20°C the osmotic pressure of 45 gm per litre solution of a substance is 3.2 atmosphere. Calculate the value of solution constant. The molecular mass of the substance is 342.
Solution:
Step 1: The osmotic pressure (π) is related to molarity (C) using the formula:

$$\pi = CRT$$

where $R = 0.0821$ L atm mol^{-1}K^{-1} and $T = 293$ K.
Step 2: Molarity C is given by:

$$C = \frac{\text{mass of solute}}{\text{molar mass} \times \text{volume (L)}}$$

Substituting values,

$$C = \frac{45}{342 \times 1} = 0.1316 \text{ mol/L}$$

Step 3: Now, solving for C,

$$3.2 = (0.0821 \times 293)C$$

$$C = \frac{3.2}{0.0821 \times 293} = 0.1332 \text{ mol/L}$$

> Quick Tip
>
> Osmotic pressure calculations use the formula $\pi = CRT$. Ensure correct unit conversions for temperature and gas constant.

(b) At 298 K conductivity of 0.20 M KCl solution is 0.0248 S cm^{-1}. Calculate its molar conductivity.
Solution:
Step 1: The formula for molar conductivity (Λ_m) is:

$$\Lambda_m = \frac{\kappa \times 1000}{C}$$

where $\kappa = 0.0248$ S cm^{-1} and $C = 0.20$ M.
Step 2: Substituting values:

$$\Lambda_m = \frac{0.0248 \times 1000}{0.20} = 124 \text{ S cm}^2 \text{ mol}^{-1}$$

Quick Tip

Molar conductivity is calculated using $\Lambda_m = \frac{\kappa \times 1000}{C}$, where κ is conductivity and C is concentration.

(c) Write the units of velocity and velocity constant for zero order reaction.
Solution:
Step 1: For a zero-order reaction, the rate equation is:

$$\text{Rate} = k[A]^0$$

Step 2: The unit of velocity (rate of reaction) is:

$$\text{mol L}^{-1}\text{s}^{-1}$$

Step 3: The unit of rate constant for a zero-order reaction is:

$$\text{mol L}^{-1}\text{s}^{-1}$$

Quick Tip

The unit of a rate constant depends on the reaction order: for a zero-order reaction, it is mol L^{-1}s^{-1}.

(d) Write I.U.P.A.C. names of the following compounds:
(i) $CH_3CH(CH_3)CH_2CH_2CH_2CHO$
Solution:
Step 1: Identify the longest carbon chain containing the aldehyde group.
The parent chain contains 6 carbons, making it a hexanal.
Step 2: Number the chain starting from the aldehyde functional group.
A methyl group is attached to carbon 3.
Step 3: The IUPAC name is:

3-methylhexanal

Quick Tip

In aldehydes, numbering starts from the carbonyl carbon, and substituents are named accordingly.

(ii) $CH_3COCH_2COCH_3$
Solution:
Step 1: Identify the longest chain containing the ketone groups.
Step 2: The parent name is pentane with two ketone groups at positions 2 and 4.
Step 3: The IUPAC name is:

$$2,4\text{-pentanedione}$$

> Quick Tip
>
> For diketones, use the suffix 'dione' and specify ketone positions in the longest chain.

3.
(a) The velocity of a gaseous reaction is halved, whereas the volume of the pot is doubled. Calculate the order of reaction.
Solution:
Step 1: The rate of reaction is given by:

$$\text{Rate} \propto [C]^n$$

where n is the order of the reaction.
Step 2: Since the volume is doubled, the concentration is halved:

$$[C]_{\text{new}} = \frac{[C]}{2}$$

Step 3: The rate is also halved:

$$\frac{\text{Rate}_{\text{new}}}{\text{Rate}} = \left(\frac{1}{2}\right)^n = \frac{1}{2}$$

Step 4: Comparing,

$$\left(\frac{1}{2}\right)^n = \frac{1}{2}$$

$$n = 1$$

Thus, the order of reaction is **1**.

> Quick Tip
>
> The order of reaction can be determined using the rate equation: $R \propto [C]^n$. Compare rate changes with concentration changes.

(b) Write *two* characteristic properties of transition metals.
Solution:
1. **Variable oxidation states:** Transition metals exhibit multiple oxidation states due to the involvement of d-electrons in bonding.

2. **Formation of colored compounds:** Transition metal ions form colored solutions due to d-d electronic transitions.

> Quick Tip
>
> Transition metals exhibit unique properties such as variable oxidation states, catalytic behavior, and paramagnetism due to unpaired d-electrons.

(c) Identify (A) and (B) in the following reactions:

$$CH_3CONH_2 \xrightarrow{P_2O_5,\Delta} (A) \xrightarrow{4[H],Sn/HCl} (B)$$

Solution:
Step 1: The given reaction sequence suggests dehydration followed by reduction.
- Dehydration of acetamide (CH_3CONH_2) using P_2O_5 forms methyl isocyanide (CH_3NC).

$$CH_3CONH_2 \xrightarrow{P_2O_5,\Delta} CH_3NC$$

So, (A) = Methyl isocyanide (CH_3NC).
Step 2: The second step is catalytic reduction using Sn/HCl.
- Reduction of methyl isocyanide leads to the formation of **methyl amine** ($CH_3CH_2NH_2$).

$$CH_3NC \xrightarrow{4[H],Sn/HCl} CH_3CH_2NH_2$$

So, (B) = Methyl amine ($CH_3CH_2NH_2$).

> Quick Tip
>
> Dehydration of amides with P_2O_5 forms isocyanides, which can be reduced to primary amines using catalytic hydrogenation.

4.
(a) For a first-order reaction, prove that the time taken in completion of 3/4 part of the reaction is two times that of its half-life period.
Solution:
Step 1: The integrated rate law for a first-order reaction is:

$$t = \frac{2.303}{k} \log \frac{[A]_0}{[A]}$$

Step 2: For half-life, at $t = t_{1/2}$, $[A] = \frac{[A]_0}{2}$:

$$t_{1/2} = \frac{0.693}{k}$$

Step 3: When 3/4 of the reaction is complete, $[A] = \frac{[A]_0}{4}$:

$$t = \frac{2.303}{k} \log \frac{[A]_0}{[A]_0/4}$$

$$t = \frac{2.303}{k} \log 4$$

$$t = \frac{2.303}{k} \times 0.602$$

$$t = 2t_{1/2}$$

Thus, the time taken for 3/4 completion is twice the half-life.

Quick Tip

For a first-order reaction, the fraction of reactant remaining can be analyzed using the integrated rate equation $t = \frac{2.303}{k} \log \frac{[A]_0}{[A]}$.

(b) Explain the importance of complex compounds in qualitative analysis with a suitable example.

Solution:

Step 1: Complex compounds are used in qualitative analysis due to their selective reactivity with metal ions.

Step 2: Example - **Ammonia Complexation with Copper**:

$$Cu^{2+} + 4NH_3 \rightarrow [Cu(NH_3)_4]^{2+}$$

This forms a deep blue solution, aiding in the detection of Cu^{2+} ions.

Quick Tip

Complex formation in qualitative analysis enhances selective detection of metal ions through distinct color changes.

(c) Write the chemical equations for the preparation of 1-iodobutane from the following:

(i) 1-butanol

Solution:

$$CH_3CH_2CH_2CH_2OH + HI \rightarrow CH_3CH_2CH_2CH_2I + H_2O$$

(ii) 1-chlorobutane

$$CH_3CH_2CH_2CH_2Cl + NaI \xrightarrow{acetone} CH_3CH_2CH_2CH_2I + NaCl$$

(iii) But-1-ene

$$CH_3CH_2CH = CH_2 + HI \rightarrow CH_3CH_2CH_2CH_2I$$

Quick Tip

1-Iodobutane can be synthesized via nucleophilic substitution or addition reactions involving iodide sources.

(d) An aromatic compound (A) on treatment with aqueous ammonia and heating forms compound (B), which on heating with Br_2 and KOH forms a compound (C) of molecular formula C_6H_7N. Write the structures and names of the compounds (A), (B), and (C).

Solution:

Step 1: The given reaction suggests the Hoffmann bromamide degradation.

Step 2: The probable reactants and products are:

- Compound (A): Benzamide ($C_6H_5CONH_2$) - Compound (B): Aniline ($C_6H_5NH_2$) - Compound (C): Phenyl isocyanide (C_6H_5NC)

Reactions:

$$C_6H_5CONH_2 + NH_3 \rightarrow C_6H_5NH_2 + H_2O$$

$$C_6H_5NH_2 + Br_2 + KOH \rightarrow C_6H_5NC + KBr + H_2O$$

Quick Tip

The Hoffmann bromamide reaction converts amides to amines, and further treatment with Br_2/KOH can yield isocyanides.

5.

(a) How does the acidified $KMnO_4$ solution react with (i) ferrous sulphate, (ii) SO_2, (iii) oxalic acid, and (iv) sodium thiosulphate?

Solution:

Step 1: The acidified $KMnO_4$ acts as a strong oxidizing agent and reacts with various reducing agents.

Step 2: Reactions:

(i) With ferrous sulphate:

$$2KMnO_4 + 10FeSO_4 + 8H_2SO_4 \rightarrow 5Fe_2(SO_4)_3 + 2MnSO_4 + K_2SO_4 + 8H_2O$$

(ii) With SO_2:

$$2KMnO_4 + 5SO_2 + 2H_2O \rightarrow 2MnSO_4 + K_2SO_4 + 2H_2SO_4$$

(iii) With oxalic acid:

$$2KMnO_4 + 5(COOH)_2 + 3H_2SO_4 \rightarrow 2MnSO_4 + 10CO_2 + 8H_2O + K_2SO_4$$

(iv) With sodium thiosulphate:

$$2KMnO_4 + 5Na_2S_2O_3 + 6H_2SO_4 \rightarrow 2MnSO_4 + 5Na_2SO_4 + 3S + K_2SO_4 + 3H_2O$$

Quick Tip

Acidified $KMnO_4$ acts as an oxidizing agent, converting reducing agents into their oxidized forms while itself being reduced to Mn^{2+}.

(b) Write I.U.P.A.C. names of the following:
(i) $[Co(NH_3)_6]Cl_3$
(ii) $[Ti(H_2O)_6]^{3+}$
(iii) $K_2[Ni(CN)_4]$
(iv) $[Pt(NH_3)_2Cl_2]$
Solution:
Step 1: Identify the ligands, oxidation state, and coordination number.
Step 2: The correct IUPAC names are:
(i) **Hexaamminecobalt(III) chloride**
(ii) **Hexaaquatitanium(III) ion**
(iii) **Potassium tetracyanonickelate(II)**
(iv) **Diammine dichloroplatinum(II)**

Quick Tip

In coordination compounds, ligands are named first in alphabetical order, followed by the central metal with oxidation state in Roman numerals.

(c) How will you convert: (write chemical equations only)
(i) 1-bromopropane into 2-bromopropane

$$CH_3CH_2CH_2Br \xrightarrow{alc.KOH} CH_3CH = CH_2 \xrightarrow{HBr, Peroxide} CH_3CHBrCH_3$$

(ii) 2-bromopropane into 1-bromopropane

$$CH_3CHBrCH_3 \xrightarrow{alc.KOH} CH_3CH = CH_2 \xrightarrow{HBr} CH_3CH_2CH_2Br$$

(iii) Chlorobenzene into Diphenyl

$$C_6H_5Cl + 2Na + C_6H_5Cl \xrightarrow{DryEther} C_6H_5 - C_6H_5 + 2NaCl$$

(iv) Chlorobenzene into Phenol

$$C_6H_5Cl + NaOH \xrightarrow{573K, 300atm} C_6H_5OH + NaCl$$

Quick Tip

Wurtz reaction is used for diphenyl preparation, while nucleophilic substitution helps convert chlorobenzene to phenol.

(d) How will you convert glucose into (i) glucose phenylhydrazone and (ii) n-hexane? Write chemical equations only.

(i) Glucose into Glucose Phenylhydrazone

$$C_6H_{12}O_6 + C_6H_5NHNH_2 \rightarrow C_6H_{11}O_5CH = NNHC_6H_5 + H_2O$$

(ii) Glucose into n-Hexane

$$C_6H_{12}O_6 \xrightarrow{HI} C_6H_{14}$$

Quick Tip

Glucose forms phenylhydrazone derivatives with phenylhydrazine, while reduction with HI converts it to n-hexane.

6.

(a) An aqueous solution containing 12.48 gm of barium chloride in 1.0 kg of water, boils at 373.0832 K. Calculate the degree of dissociation of barium chloride. ($K_b =$ 0.52 kg mol^{-1}, molar mass of $BaCl_2$ = 208.34)

Solution:

Step 1: The elevation in boiling point is given by:

$$\Delta T_b = K_b \times m \times i$$

where m is the molality and i is the van't Hoff factor.

Step 2: Calculate molality:

$$m = \frac{\text{Mass of solute (g)}}{\text{Molar mass (g/mol)} \times \text{Mass of solvent (kg)}}$$

$$m = \frac{12.48}{208.34 \times 1} = 0.0599 \text{ mol/kg}$$

Step 3: Calculate van't Hoff factor i:

$$\Delta T_b = 373.0832 - 373 = 0.0832$$

$$i = \frac{\Delta T_b}{K_b \times m} = \frac{0.0832}{0.52 \times 0.0599} = 2.67$$

Step 4: Degree of dissociation α is calculated as:

$$i = 1 + \alpha(n-1)$$

For $BaCl_2$, $n = 3$:

$$2.67 = 1 + \alpha(3-1)$$

$$\alpha = \frac{2.67 - 1}{2} = 0.835$$

Thus, the degree of dissociation is **0.835**.

Quick Tip

The van't Hoff factor (i) accounts for ionization in colligative properties and is used to determine dissociation in solutions.

OR

(a) 1.2% NaCl solution is isotonic to 7.2% glucose solution. Calculate the van't Hoff factor for NaCl solution.

Solution:

Step 1: The van't Hoff factor (i) is determined using:

$$\pi = iMRT$$

Since the solutions are isotonic, their osmotic pressures are equal:

$$i \times M_{\text{NaCl}} = M_{\text{glucose}}$$

Step 2: Given:

$$M_{\text{NaCl}} = \frac{1.2}{58.5} = 0.0205 \text{ mol/L}$$

$$M_{\text{glucose}} = \frac{7.2}{180} = 0.04 \text{ mol/L}$$

Step 3: Solve for i:

$$i = \frac{M_{\text{glucose}}}{M_{\text{NaCl}}} = \frac{0.04}{0.0205} = 1.95$$

Thus, the van't Hoff factor for NaCl is 1.95.

Quick Tip

For isotonic solutions, osmotic pressure equations can be equated to determine the van't Hoff factor.

(b) Name the reagents used in the following reactions:

(i) Bromination of phenol into 2,4,6-tribromophenol

Reagent: Br_2 (Bromine Water)

(ii) Conversion of benzyl alcohol into benzoic acid

Reagent: $K_2Cr_2O_7$ / H_2SO_4 (Acidic Potassium Dichromate)

(iii) Dehydration of propan-2-ol into propene

Reagent: H_2SO_4 at $443K$ (Concentrated Sulfuric Acid)

(iv) Conversion of butan-2-one into butan-2-ol

Reagent: $NaBH_4$ (Sodium Borohydride) or $LiAlH_4$ (Lithium Aluminium Hydride)

(v) Oxidation of primary alcohol into carboxylic acid

Reagent: $KMnO_4$ / H_2SO_4 (Acidified Potassium Permanganate)

Quick Tip

Reagents used in organic transformations are crucial for oxidation, reduction, and substitution reactions.

OR
(b) Write short notes on the following:
(i) Reimer-Tiemann's reaction
Solution:
Step 1: Reimer-Tiemann reaction is used to introduce a formyl (-CHO) group into phenol.
Step 2: Reaction:

$$C_6H_5OH + CHCl_3 + NaOH \to o-\text{hydroxybenzaldehyde} + p-\text{hydroxybenzaldehyde}$$

Step 3: The reaction mechanism involves the formation of a dichlorocarbene intermediate, which undergoes electrophilic substitution at the ortho- and para-positions of phenol.

Quick Tip

Reimer-Tiemann reaction is an electrophilic substitution reaction introducing an aldehyde (-CHO) group into phenol.

(ii) Williamson's synthesis
Solution:
Step 1: Williamson's synthesis is used for the preparation of ethers.
Step 2: Reaction:

$$R-O^- + R'-X \to R-O-R' + X^-$$

where $R'X$ is an alkyl halide and $R-O^-$ is an alkoxide ion.
Step 3: Example:

$$C_2H_5ONa + CH_3I \to C_2H_5OCH_3 + NaI$$

Quick Tip

Williamson's synthesis involves an SN2 reaction mechanism and is widely used for asymmetric ether synthesis.

7.
(a) Calculate the e.m.f. of the following cell writing the cell reaction:

$$\text{Cu}|\text{Cu}^{2+}(1M)||\text{Ag}^{+}(1M)|\text{Ag}$$

Given:

$$E^0_{Cu^{2+}/Cu} = +0.34 \text{ volt}, \quad E^0_{Ag^+/Ag} = +0.80 \text{ volt}$$

Solution:
Step 1: The cell reaction is:

$$Cu^{2+} + 2e^- \rightarrow Cu \quad (E^0 = +0.34V)$$

$$Ag^+ + e^- \rightarrow Ag \quad (E^0 = +0.80V)$$

Step 2: The overall cell reaction:

$$Cu + 2Ag^+ \rightarrow Cu^{2+} + 2Ag$$

Step 3: The e.m.f. of the cell is calculated as:

$$E_{cell} = E^0_{cathode} - E^0_{anode}$$

$$E_{cell} = 0.80 - 0.34 = 0.46V$$

Thus, the e.m.f. of the cell is **0.46V**.

Quick Tip

The standard e.m.f. of a galvanic cell is calculated using $E_{cell} = E^0_{cathode} - E^0_{anode}$.

OR
(a) The standard electrode potential of Daniel cell is 1.1 volt. Calculate the standard Gibbs energy for the following reaction:

$$Zn(s) + Cu^{2+}(aq) \rightarrow Zn^{2+}(aq) + Cu(s)$$

Solution:
Step 1: Gibbs free energy is related to e.m.f. using:

$$\Delta G^0 = -nFE^0_{cell}$$

where $n = 2$ (electrons transferred), $F = 96500$ C/mol, and $E^0_{cell} = 1.1V$.
Step 2: Calculate:

$$\Delta G^0 = -(2 \times 96500 \times 1.1)$$

$$\Delta G^0 = -212300 \text{ J/mol} = -212.3 \text{ kJ/mol}$$

Thus, the Gibbs free energy is **-212.3 kJ/mol**.

Quick Tip

The Gibbs free energy of a cell reaction is calculated using $\Delta G^0 = -nFE^0_{cell}$.

(b) What happens when – (write chemical equations only)
(i) Mixture of calcium acetate and calcium formate is dry distilled?

$$(COO)_2Ca + HCOO_2Ca \xrightarrow{\Delta} CH_3CHO + CaCO_3$$

(ii) Acetone is distilled with conc. H_2SO_4**?**

$$2CH_3COCH_3 \xrightarrow{H_2SO_4} CH_3CH = CH_2 + CH_3COOH$$

(iii) Acetone is heated with chloroform in presence of alkali?

$$CH_3COCH_3 + CHCl_3 + NaOH \rightarrow CH_3CCl_3OH + NaCl$$

(iv) Formic acid is heated with Fehling's solution?

$$HCOOH + 2Cu^{2+} + 5OH^- \rightarrow CO_2 + Cu_2O + 3H_2O$$

(v) Formaldehyde is heated with conc. NaOH solution?

$$HCHO + NaOH \rightarrow HCOONa + H_2$$

Quick Tip

Dry distillation of salts, aldol condensation, and haloform reactions follow unique mechanistic pathways.

OR
(b) Explain the following:
(i) Benzoin condensation
Solution:
Step 1: In benzoin condensation, two aldehyde molecules condense in presence of cyanide ion.
Step 2: Reaction:

$$2C_6H_5CHO + CN^- \rightarrow C_6H_5CH(OH)C(=O)C_6H_5$$

Benzoin is formed.

Quick Tip

Benzoin condensation is a nucleophilic addition reaction involving aldehydes.

(ii) Perkin's reaction
Solution:
Step 1: Perkin's reaction involves condensation of aromatic aldehydes with acid anhydrides.
Step 2: Reaction:

$$C_6H_5CHO + (CH_3CO)_2O \xrightarrow{NaOAc} C_6H_5CH = CHCOOH$$

It forms cinnamic acid.

Quick Tip

Perkin's reaction is used for the synthesis of ,-unsaturated carboxylic acids.

(iii) Cross Cannizzaro reaction
Solution:
Step 1: Cross Cannizzaro reaction occurs between two different aldehydes, one undergoing oxidation and the other reduction.
Step 2: Example:

$$HCHO + C_6H_5CHO + NaOH \rightarrow HCOONa + C_6H_5CH_2OH$$

Quick Tip

Cross Cannizzaro reaction involves disproportionation of non-enolizable aldehydes in strong base.
