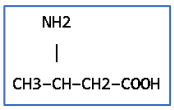
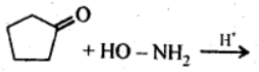
	INDIAN SCHOOL AL WADI AL KABIR	
Class: XII	**Department: SCIENCE 2025– 26** **SUBJECT: CHEMISTRY**	**Date: 11/08/2025**
Worksheet No: 3 **With Answers**	**Chapter:** **Aldehydes, Ketones and Carboxylic Acids**	**Note:** **A4 FILE FORMAT**
Name of The Student:	**Class & Sec:**	**Roll No.:**

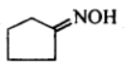
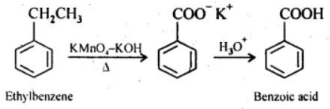
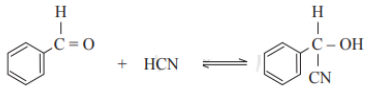
Q. No.	Questions	Marks
	Competency Focused Questions – Multiple Choice (1 Mark)	
1.	The IUPAC name of **$CH_3–CH_2–CO–CH_3$** is: (a) Prop-1-en-2-one (b) But-2-en-1-one (c) Butanone (d) None of these	1
2.	The IUPAC name of **$CH_2=CH–CHO$** is: (a) Prop-2-enal (b) Crotonaldehyde (c) But-2-en-1-carbaldehyde (d) But-2-en-1-al	1
3.	The IUPAC name of the compound **$CH_3–CH_2–CH=CH–CH_3$** (a) Pent-3-ene (b) Methyl but-2-ene (c) Pentan-2-ene (d) Pent-2-ene	1
4.	The structure of 4-chloropentan-2-one is: (a) $CH_3–CO–CH_2–CH(Cl)–CH_3$ (b) $CH_3–CH(Cl)–CH_2–CH_2–CO–CH_3$ (c) $CH_3–CH_2–CO–CH(Cl)–CH_2–CH_3$ (d) $CH_3–CO–CH(Cl)–CH_2–CH_3$	1
5.	The IUPAC name of the compound  (a) 3-aminobutanoic acid (b) 2-amino-3-urea (c) 2-amino-3-propanoic acid (d) 2-amino-3-(ureido)-propanoic acid	1
6.	The IUPAC name of the compound $CH_3–CO–CH_2–CH_2–CH_2–NH_2$ is: (a) Butan-3-amine-1-al (b) 5-aminopentan-2-one	1

	(c) 4-hydroxy pentan-2-one (d) 4-hydroxy pentan-1-one	
7.	Two compounds M and N have the same general formula $C_nH_{2n}O$, but different structures: • Compound N belongs to the ketone series, with the carbonyl group located at an internal position in the carbon chain. • Compound M reacts with one mole of hydrogen cyanide to yield a compound containing a hydroxynitrile group. • Identifying the functional groups: (a) M is an aldehyde and N is a ketone (b) M is an aldehyde and N is an acid anhydride (c) Both are ketones (d) Both are aldehydes	1
8.	The product formed when propanone reacts with methylmagnesium bromide followed by hydrolysis is: (a) 2-methylpropan-2-ol (b) 2-methylpropan-1-ol (c) Butan-2-ol (d) 2-methylpropanal	1
	Assertion–Reason Questions & Answers (A) Both A and R are true, and R is the correct explanation of A (B) Both A and R are true, but R is NOT the correct explanation of A (C) A is true, but R is false (D) A is false, but R is true	
9.	**Assertion (A):** Aldehydes and ketones both react with Tollen's reagent to form a silver mirror. **Reason (R):** Both contain a carbonyl group.	1
10.	**Assertion (A):** Benzaldehyde and formaldehyde undergo Cannizzaro's reaction. **Reason (R):** Because they are non-reactive in nature.	1
11.	**Assertion (A):** The boiling points of aldehydes and ketones are higher than hydrocarbons and ethers of comparable molecular mass. **Reason (R):** Aldehydes and ketones have higher boiling points due to strong dipole–dipole interactions from their polar carbonyl group.	1
12.	**Assertion (A):** Formaldehyde is a planar molecule. **Reason (R):** It contains an sp^2-hybridised carbon atom.	1
13.	**Assertion (A):** Carboxylic acids have higher boiling points than alkanes. **Reason (R):** Carboxylic acids exist as resonance hybrids.	1
14.	**Assertion (A):** Carboxylic acids contain a carbonyl group but do not give characteristic reactions of it. **Reason (R):** electron-withdrawing by –OH and resonance reduce electrophilicity of carboxylic carbon compared to aldehyde carbonyl carbon	1

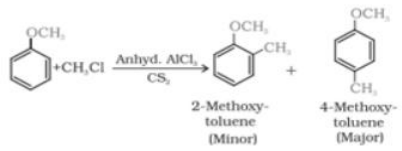
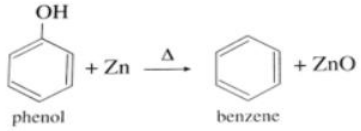
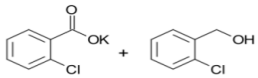
15.	**Assertion (A):** The α-hydrogen atom in carbonyl compounds is less acidic. **Reason (R):** The anion formed after loss of the α-hydrogen atom is resonance stabilized.	1
16.	**Assertion (A):** Benzaldehyde does not give an aldol condensation reaction under normal conditions. **Reason (R):** Benzaldehyde does not contain any α-hydrogen atom.	1
	Very Short Answer Type Questions	
17.	Name the reaction in which toluene is oxidized to benzaldehyde using chromyl chloride.	1
18.		1
19.	What is the product when acetyl chloride is treated with hydrogen in the presence of Pd-$BaSO_4$?	1
20.	Convert Ethylbenzene to Benzoic acid	1
21.	What is the product when benzaldehyde reacts with Hydrogen cyanide?	1
22.	Distinguish Benzoic acid and Ethyl benzoate.	1
23.	What is the product when $CH_3{-}CH{=}CH{-}CH_2{-}CN$ is treated with DIBAL-H followed by water?	1
24.	What are the products of ozonolysis of 2,3-dimethyl but-2-ene followed by Zn/H_2O?	1
	Short Answer Type Questions	
25.	Explain why aldehydes are more reactive towards nucleophilic addition than ketones. Support with structural reasoning	2
26.	An unknown compound gives a silver mirror with Tollens' reagent but no reaction with 2,4-Dinitrophenylhydrazine (2,4-DNP). Identify the functional group and explain.	2
27.	Write the stepwise mechanism for the formation of 2,4-Dinitrophenylhydrazone from an aldehyde.	2
28.	How can you experimentally distinguish between an aldehyde and a ketone? Write the relevant chemical reactions.	2
29.	A compound with molecular formula C_3H_6O gives a positive iodoform test. Identify the compound and write the reaction involved.	2
30.	Write the chemical reaction when ethanal is treated with HCN in the presence of KCN.	2
31.	Why do carboxylic acids have higher boiling points than aldehydes and ketones of similar molecular weight?	2
32.	Write the reaction sequence to prepare ethanoic acid from ethanol.	2
33.	What is the role of concentrated H_2SO_4 in the esterification reaction between ethanoic acid and ethanol? Write the reaction.	2
34.	Between benzaldehyde and acetophenone, which one gives a positive Tollens' test? Write the reaction.	2
35.	Which of the following will give a yellow or orange ppt. with 2,4 DNP? (i) **Propanal** (ii) Propanone (iii) Propanoic acid	3

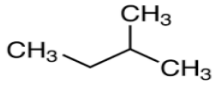
36.	Arrange the products obtained in the following cases in the increasing order of their pKa values: A. Oxidation of ethanol in presence of acidified potassium dichromate B. Reaction of propanoic acid with Br_2 in the presence of red Phosphorus C. Reaction of isopropyl magnesium bromide with carbon dioxide, followed by hydrolysis. D. Reaction of propanoic acid with Cl_2 in the presence of red Phosphorous.	3
37.	Carry out the following conversions. **(Attempt any 3)** a. Butan-2-one to 3-Methylpentan-3-ol b. Anisole to 4-Methoxytoluene c. Phenol to Benzene d. Chloroethane to Ethoxy ethane	3
	Long Answer Type Questions	
38. **CBSE SAMPLE PAPER 2025-26**	Answer the following questions: I. Write the structure of expected product of Cannizarro reaction of 2-chlorobenzaldehyde. II. How would the presence of $-SO_3H$ group effect the basic strength of aniline. III. Convert acetic acid to ethanamine. IV. Write the steps to prepare Benzoic acid from Benzoyl chloride. V. Give a chemical test to distinguish between: propanal and propanone	5
39. **CBSE SAMPLE PAPER 2025-26**	Answer the following questions: I. Write the structure of expected product of Wolf-Kishner reduction of 2 –methylbutanal. II. How would the presence of $-SO_3H$ group effect the acidic strength of benzoic acid III. Prepare acetic acid from ethanamine. IV. Convert Aniline to benzoic acid. V. Give a chemical test to distinguish between: propanal and ethanal.	5
40. **CBSE BOARD PAPER 2025**	1. Give plausible explanation for each of the following : (a) Sodium hydrogen sulphite is used for separation and purification of aldehydes. (b) 2,2,6-trimethylcyclohexanone does not form cyanohydrin. (c) Only one – NH2 group of semicarbazide is involved in the formation of semicarbazone. 2. Give a simple chemical test to distinguish between the following pairs of compounds : i. Benzaldehyde and Phenol ii. Butanal and Butan-2-one	3+2

Answer Key

1.	(c) Butanone	1
2.	(a) Prop-2-enal	1
3.	(d) Pent-2-ene	1
4.	(a) $CH_3–CO–CH_2–CH(Cl)–CH_3$	1
5.	(a) 3-amino butanoic acid	1
6.	(b) 5-aminopentan-2-one	1
7.	(a) M is an aldehyde and N is a ketone	1
8.	(a) 2-methylpropan-2-ol	1
9.	D	1
10.	C	1
11.	A	1
12.	A	1
13.	B	1
14.	D	1
15.	D	1
16.	A	1
17.	Etard reaction	1
18.		1
19.	Ethanal	1
20.		1
21.		1
22.	Sodium bicarbonate test	1
23.	$CH_3–CH=CH–CH_2–CHO$	1
24.	Two molecules of acetone	1
25.	Aldehydes have the carbonyl carbon attached to one alkyl group and one hydrogen, so less steric hindrance and more electrophilic character. Ketones have two alkyl groups, increasing steric hindrance and electron donation, making them less reactive.	2
26.	The compound contains an aldehyde group because Tollens' reagent gives a silver mirror only with aldehydes. The absence of 2,4-DNP reaction is unusual but may be due to experimental conditions.	2
27.	Nucleophilic attack of 2,4-DNP nitrogen on carbonyl carbon of aldehyde Formation of tetrahedral intermediate Elimination of water molecule Formation of 2,4-Dinitrophenylhydrazone (yellow/orange precipitate)	2

28.	Tollens' test: $\text{R–CHO} + 2[Ag(NH_3)_2]^+ + 3OH^- \rightarrow R\text{–}COO^- + 2Ag\downarrow + 4NH_3 + 2H_2O$ (Aldehyde gives silver mirror; ketone does not.) Fehling's test (for aldehydes): $\text{R–CHO} + 2Cu^{2+} + 5OH^- \rightarrow R\text{–}COO^- + Cu_2O\downarrow + 3H_2O$	2
29.	Compound: Propanone (acetone). Iodoform test: $CH_3COCH_3 + 3I_2 + 4OH^- \rightarrow CHI_3\downarrow + CH_3COO^- + 3I^- + 3H_2O$	2
30.	Cyanohydrin formation: $CH_3CHO + HCN \xrightarrow{KCN} CH_3CH(OH)CN$	2
31.	Carboxylic acids form strong intermolecular hydrogen bonds (–COOH groups), increasing boiling points compared to aldehydes and ketones, which have only dipole-dipole interactions.	2
32.	$CH_3CH_2OH \xrightarrow{\text{acidified } KMnO_4} CH_3-\overset{\overset{O}{\|}}{C}-OH$	2
33.	Concentrated H2SO4 acts as a catalyst and dehydrating agent to shift equilibrium towards ester formation. Esterification reaction: $CH_3COOH + C_2H_5OH \xrightarrow{H_2SO_4} CH_3COOC_2H_5 + H_2O$	2
34.	Benzaldehyde (an aldehyde) gives a positive Tollens' test: $C_6H_5CHO + 2[Ag(NH_3)_2]^+ + 3OH^- \rightarrow C_6H_5COO^- + 2Ag\downarrow + 4NH_3 + 2H_2O$ Acetophenone (a ketone) does not react.	2
35.	A. (i) and (ii) • Aldehydes and ketones react with 2,4 dinitrophenylhydrazine to give a yellow/orange ppt of 2,4 dinitrophenylhydrazone • Chemical Equations	1 ½ 1 ½
36.	**Attempt any 3** A. $CH_3CH_2OH \xrightarrow{\text{Acidified } K_2Cr_2O_7} CH_3COOH$ B. $CH_3CH_2COOH \xrightarrow{Br_2/\text{ Red P}} CH_3CHBrCOOH$ C. $(CH_3)_2CHMgCl \xrightarrow{(i)CO_2\ (ii)H^+,H_2O} (CH_3)_2CHCOOH$ D. $CH_3CH_2COOH \xrightarrow{Cl_2/\text{ Red P}} CH_3CHClCOOH$ Order of acidity : $CH_3CHClCOOH > CH_3CHBrCOOH > CH_3COOH > (CH_3)_2CHCOOH$	3

37.	**Attempt any 3** I. $CH_3CH_2COCH_3 + CH_3CH_2MgCl \xrightarrow{\text{dry ether}} (CH_3CH_2)_2C(OMgCl)CH_3 \xrightarrow{H_2O} (CH_3CH_2)_2C(OH)CH_3$ II.  2-Methoxy-toluene (Minor) 4-Methoxy-toluene (Major) III.  phenol benzene IV. $CH_3CH_2Cl + CH_3CH_2ONa \longrightarrow CH_3CH_2OCH_2CH_3 + NaCl$	3
38.	I. The structures of expected products of Cannizarro reaction of 2-chloro -benzaldehyde  II. $-SO_3H$ is electron withdrawing in nature, hence it decreases the availability of lone pair for donation, hence basic nature of aniline decrease due to the presence of sulphonic group. III. Following are the steps to convert acetic acid to ethanamine. $CH_3COOH \xrightarrow{LiAlH_4} CH_3CH_2OH \xrightarrow{SOCl_2} CH_3CH_2Cl \xrightarrow[\text{excess of } NH_3]{} CH_3CH_2NH_2$ IV. Benzoic acid from Benzoyl chloride: $C_6H_5COCl \xrightarrow{H_2\text{-}Pd/BaSO_4} C_6H_5CHO \xrightarrow{\text{acidified } KMnO_4} C_6H_5COOH$ V. The chemical test to distinguish between propanal and propanone is Tollen test (Silver Mirror) Propanal on heating in a water bath with ammonical silver nitrate (Tollen's reagent) forms a silver mirror on the sides of the test tube. Propanone on heating in a water bath with Tollen's reagent does not show any reaction.	5

39.	I. Product formed on Wolf-Kishner reduction of 2 –methylbutanal is  II. The strength of benzoic acid depends on its ability to donate the proton and stability of the conjugate base formed .Sulphonic acid is an electron withdrawing group , it presence increases the ability to release proton . Hence the acidic strength will be increased . III. To convert acetic acid from ethanamine following are the steps involved : $CH_3CH_2NH_2 \xrightarrow{HNO_2} CH_3CH_2OH \xrightarrow{\text{acidified } KMnO_4} CH_3COOH$ IV. Aniline to benzoic acid: $C_6H_5NH_2 \xrightarrow{NaNO_2/\ HCl} C_6H_5N_2^+Cl^- \xrightarrow{KCN} C_6H_5CN \xrightarrow{\text{complete hydrolysis}} C_6H_5COOH$ V. a chemical test to distinguish between: propanal and ethanal Ethanal gives yellow precipitate on heating with iodine in the presence of sodium hydroxide (positive Iodoform test) Propanal will not give any reaction on heating with iodine in the presence of sodium hydroxide (negative Iodoform test)	5
40.	1. a. Aldehydes react with sodium hydrogen sulphite to form aldehyde–bisulphite addition compounds which are crystalline and water soluble. b. In 2,2,6-trimethylcyclohexanone, the bulky methyl groups at α-positions create severe steric hindrance**,** preventing nucleophilic attack. c. The $–NH_2$ group attached to the –NH (next to carbonyl group) is less reactive due to electron withdrawal by the C=O group, and involved in resonance. 2a. **Test:** *$FeCl_3$ test* • Phenol: Gives violet colour with neutral $FeCl_3$ solution due to phenoxide complex formation. • Benzaldehyde: No such colour change. b. **Test:** *Tollen's reagent test* • Butanal (aldehyde): Gives **silver mirror** due to oxidation to carboxylate ion. • Butan-2-one (ketone): No silver mirror formed.	1 1 1
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