CHEMISTRY (CODE – 043)

Chapter-wise Test: Aldehydes, Ketones and Carboxylic Acids

(NCERT Class XII Chemistry, Unit 8: Aldehydes, Ketones and Carboxylic Acids)

PRACTICE QUESTION PAPER

CLASS XII (2026-27)

Time: 1½ hours **Max. Marks: 35**

GENERAL INSTRUCTIONS: Read the following instructions carefully.

1. There are 17 questions in this question paper with internal choice. All questions are based on Unit 8: Aldehydes, Ketones and Carboxylic Acids.
2. SECTION A consists of 8 multiple-choice questions carrying 1 mark each.
3. SECTION B consists of 3 very short answer questions carrying 2 marks each.
4. SECTION C consists of 4 short answer questions carrying 3 marks each.
5. SECTION D consists of 1 case-based question carrying 4 marks.
6. SECTION E consists of 1 long answer question carrying 5 marks.
7. All questions are compulsory. Internal choice is provided in Questions 9 to 15, 16(iii) and 17.
8. Questions 2, 3, 9, 12, 13, 14 and 16 are based on figures, structures or data tables given in the paper.
9. Use of log tables and calculators is not allowed.

SECTION A

Questions 1 to 8 are multiple choice questions. Only one of the choices is correct. Select and write the correct choice as well as the answer to these questions. Each question carries 1 mark.

1 The IUPAC name of mesityl oxide, $(CH_3)_2C{=}CH{-}CO{-}CH_3$, is: — 1

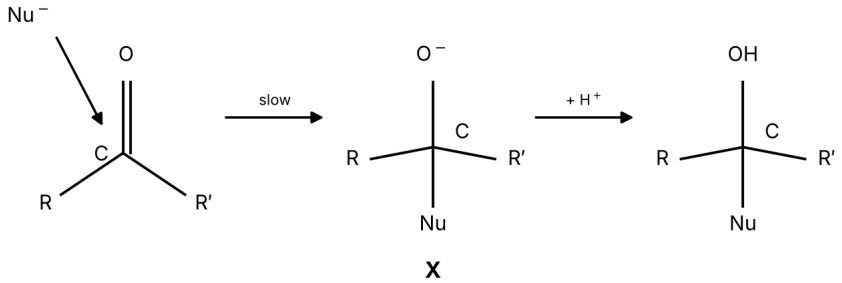
A. 2-Methylpent-2-en-4-one
B. 4-Methylpent-3-en-2-one
C. 4-Methylpent-2-en-4-one
D. 2-Methylpent-3-en-4-one

2 The table lists the reagents of the type $H_2N{-}Z$ and the products ($>C{=}N{-}Z$) formed from aldehydes and ketones. — 1

Row	Z	Reagent	Product
1	–H	Ammonia	Oxime
2	–OH	Hydroxylamine	Oxime
3	$-NH_2$	Hydrazine	Hydrazone
4	$-NHCONH_2$	Semicarbazide	Semicarbazone

Which row of the table is **incorrect**?

A. Row 1
B. Row 2
C. Row 3
D. Row 4

3	Fig. 1 shows the nucleophilic addition of Nu^- to a carbonyl compound, followed by protonation.  **X** **Fig. 1** In the formation of the intermediate X, the hybridisation of the carbonyl carbon changes from: A. sp^3 to sp^2 B. sp to sp^2 C. sp^2 to sp^3 D. sp^2 to sp	1
4	Which reagent converts ethanenitrile (CH_3CN) into ethanal selectively? A. H_2 / Pd–$BaSO_4$ B. $LiAlH_4$ C. Zn–Hg / conc. HCl D. Diisobutylaluminium hydride (DIBAL-H) followed by H_2O	1
5	When benzene is treated with carbon monoxide and hydrogen chloride in the presence of anhydrous $AlCl_3$ and CuCl, the main product is: A. benzoic acid B. benzaldehyde C. acetophenone D. benzyl alcohol	1
6	Which of the following aldehydes undergoes the Cannizzaro reaction with concentrated NaOH? A. Propanal B. 2-Methylpentanal C. 2,2-Dimethylbutanal D. Butanal	1
7	Heating sodium propanoate with soda-lime (NaOH and CaO) gives: A. ethane B. propane C. ethene D. ethanol	1
8	**Assertion (A):** Ketones are more reactive than aldehydes towards nucleophilic addition reactions. **Reason (R):** The two alkyl groups in a ketone reduce the electrophilicity of the carbonyl carbon. 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.	1

SECTION B

Question Nos. 9 to 11 are very short answer questions carrying 2 marks each.

9 **Attempt either A or B.** 2

(A) The table gives the boiling points of some compounds of comparable molecular mass.

Compound	Molecular mass	Boiling point (K)
n-Butane	58	273
Methoxyethane	60	281
Propanal	58	322
Acetone	58	329
Propan-1-ol	60	370

(i) Why do propanal and acetone boil at a higher temperature than methoxyethane?
(ii) Why is the boiling point of propan-1-ol the highest in the table?

OR

(B) Arrange CH_3CHO, CH_3CH_2OH, CH_3OCH_3 and $CH_3CH_2CH_3$ in increasing order of boiling point and give a reason for the order.

10 **Attempt either A or B.** 2

(A) (i) Write the equation for the addition of HCN to propanone. Why is a small amount of base added to the reaction?
(ii) How is the sodium hydrogensulphite addition compound of an aldehyde useful in its purification?

OR

(B) Define the following terms and give an example of each: (i) hemiacetal, (ii) ketal.

11 **Attempt either A or B.** 2

(A) Give one simple chemical test to distinguish between each pair: (i) pentan-2-one and pentan-3-one; (ii) phenol and benzoic acid.

OR

(B) Write the products formed when cyclohexanecarbaldehyde reacts with (i) zinc amalgam and dilute hydrochloric acid and (ii) excess ethanol in the presence of dry HCl.

SECTION C

Question Nos. 12 to 15 are short answer questions carrying 3 marks each.

12 **Attempt either A or B.** 1+1+1

(A) The table lists some carbonyl compounds.

Compound	Type	α-Hydrogen atoms
Methanal	Aldehyde	None
2-Methylpentanal	Aldehyde	Present
Benzaldehyde	Aldehyde	None
Benzophenone	Ketone	None
Cyclohexanone	Ketone	Present
2,2-Dimethylbutanal	Aldehyde	None

(i) Which of these compounds undergo aldol condensation with dilute alkali?
(ii) Which undergo the Cannizzaro reaction with concentrated alkali?
(iii) Which compound shows neither reaction? Give a reason.

OR

(B) Write the equations for (i) the Cannizzaro reaction of methanal, (ii) the aldol condensation of propanal. (iii) Why does benzaldehyde not undergo aldol condensation?

13 **Attempt either A or B.** 1+1+1

(A) Fig. 2 shows two routes for converting bromoethane into the carboxylic acid Q.

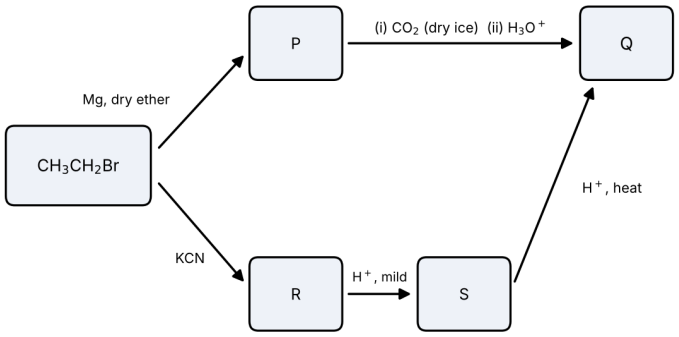


Fig. 2

(i) Identify P, Q, R and S.
(ii) How many more carbon atoms does Q have than bromoethane? What is the use of these two methods?
(iii) Why must the preparation of P be carried out in dry ether?

OR

(B) Write the equations for the preparation of benzoic acid from (i) ethylbenzene, (ii) bromobenzene (via Grignard reagent) and (iii) benzoyl chloride.

14	**Attempt either A or B.** **(A)** Fig. 3 shows the reaction of ethanal with dilute NaOH.  **Fig. 3** (i) Name the reaction and write the IUPAC names of A and B. (ii) Why are the α-hydrogen atoms of ethanal acidic? (iii) Would methanal alone undergo this reaction? Give a reason. **OR** **(B)** A mixture of ethanal and propanal is treated with dilute NaOH. Write the structural formulas of any three of the four products of this cross aldol reaction, indicating which aldehyde is the nucleophile and which is the electrophile.	1+1+1
15	**Attempt either A or B.** **(A)** Write the chemical equations for the conversion of (i) butan-1-ol to butanoic acid, (ii) ethanoic acid to ethanoyl chloride, (iii) ethanoic acid to ethyl ethanoate. **OR** **(B)** Name the reaction and write the equation for: (i) the reaction of propanoic acid with Cl_2 in the presence of red phosphorus, (ii) the electrolysis of aqueous sodium ethanoate, (iii) heating of ammonium ethanoate at high temperature.	1+1+1

SECTION D

Question No. 16 is a case-based/data-based question carrying 4 marks.

16 **Strength of carboxylic acids** — 1+1+2

Carboxylic acids are weaker than mineral acids but stronger than alcohols and most phenols. Their acid strength is expressed by the pK_a value. The table gives the pK_a values of some acids.

Acid	**pK_a**
HCl	−7.0
CF_3COOH	0.23
4-Nitrobenzoic acid	3.41
Benzoic acid	4.19
4-Methoxybenzoic acid	4.46
Ethanoic acid	4.76

Answer the following questions:

(i) Arrange benzoic acid, 4-nitrobenzoic acid and 4-methoxybenzoic acid in increasing order of acid strength. Explain the trend.
(ii) Which carboxylic acid in the table is the strongest? Give a reason.
(iii) **Attempt either A or B.**
(A) Explain why carboxylic acids are more acidic than phenols.
OR
(B) Which acid in each pair is stronger? Give a reason for each: (a) CH_3COOH or CH_2FCOOH; (b) CH_2FCOOH or $CH_2ClCOOH$.

SECTION E

Question No. 17 is a long answer question carrying 5 marks.

17	**Attempt either A or B.** **(A)** An organic compound **A** has the molecular formula $C_9H_{10}O$. It forms a 2,4-DNP derivative, reduces Tollens' reagent and undergoes the Cannizzaro reaction. On vigorous oxidation it gives benzene-1,2-dicarboxylic acid (phthalic acid). (i) Identify A and write its structure and IUPAC name. (ii) Explain how each piece of information leads to the structure. (iii) Write the equation for the reaction of A with Tollens' reagent. **OR** **(B)** An organic compound contains 69.77% carbon and 11.63% hydrogen, the rest being oxygen. Its molecular mass is 86. It does not reduce Tollens' reagent but forms an addition compound with sodium hydrogensulphite and gives a positive iodoform test. On vigorous oxidation it gives ethanoic acid and propanoic acid. (i) Calculate the empirical and molecular formulae. (Atomic masses: C = 12, H = 1, O = 16) (ii) Identify the compound and explain the tests.	5

— End of Question Paper —