CHEMISTRY (CODE – 043)

Chapter-wise Test: Alcohols, Phenols and Ethers

(NCERT Class XII Chemistry, Unit 7: Alcohols, Phenols and Ethers)

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 7: Alcohols, Phenols and Ethers.
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 CH_3–CH(Cl)–$CH(CH_3)$–$CH(CH_3)$–CH_2OH is: — 1

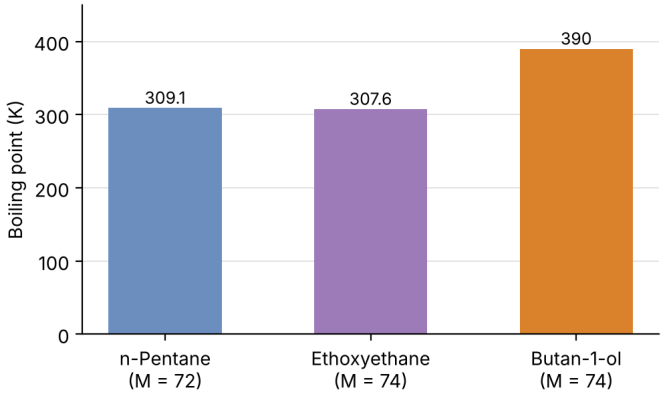
A. 4-Chloro-2,3-dimethylpentan-5-ol
B. 2-Chloro-3,4-dimethylpentan-1-ol
C. 4-Chloro-2,3-dimethylpentan-1-ol
D. 1-Chloro-2,3-dimethylpentan-4-ol

2 The table lists the common name and the IUPAC name of four compounds. — 1

Row	Compound	Common name	IUPAC name
1	$CH_3CH(OH)CH_3$	Isopropyl alcohol	Propan-2-ol
2	HO–CH_2–CH_2–OH	Glycerol	Ethane-1,2-diol
3	$(CH_3)_3C$–OH	tert-Butyl alcohol	2-Methylpropan-2-ol
4	$C_6H_5OCH_3$	Anisole	Methoxybenzene

Which row contains an **incorrect** common name?

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

3	Fig. 1 compares the boiling points of three compounds of nearly the same molecular mass.  **Fig. 1** The much higher boiling point of butan-1-ol compared to the other two compounds is due to: A. its higher molecular mass B. the greater polarity of its C–O bond compared with that of ethoxyethane C. stronger van der Waals forces between its molecules than between pentane molecules D. intermolecular hydrogen bonding between its molecules	1
4	Propene on hydroboration–oxidation, i.e. treatment with $(BH_3)_2$ followed by H_2O_2/NaOH, gives: A. propan-1-ol B. propan-2-ol C. propanal D. propane	1
5	The correct order of increasing acid strength of ethanol, water, phenol and *p*-nitrophenol is: A. ethanol < phenol < water < *p*-nitrophenol B. water < ethanol < phenol < *p*-nitrophenol C. ethanol < water < phenol < *p*-nitrophenol D. phenol < ethanol < water < *p*-nitrophenol	1
6	When phenol is treated with chloroform in the presence of aqueous sodium hydroxide, followed by acidification, the main product is: A. salicylic acid B. salicylaldehyde C. picric acid D. benzaldehyde	1
7	Anisole (methoxybenzene) is heated with concentrated HI. The products are: A. phenol and methyl iodide B. iodobenzene and methanol C. phenol and methanol D. iodobenzene and methyl iodide	1
8	**Assertion (A):** Alcohols are stronger acids than water. **Reason (R):** The alkoxide ion is a stronger base than the hydroxide ion. 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) Three alcohols P, Q and R, each having the molecular formula $C_4H_{10}O$, were shaken separately with Lucas reagent (conc. HCl + anhydrous $ZnCl_2$) at room temperature. The observations are given in the table.

Alcohol	Observation with Lucas reagent at room temperature
P	Turbidity appears immediately
Q	Turbidity appears after about 5 minutes
R	No turbidity at room temperature

(i) Classify P, Q and R as primary, secondary or tertiary alcohols, and write the structure of P.
(ii) Why does P react the fastest?

OR

(B) Arrange the following in increasing order of boiling points: (i) pentan-1-ol, *n*-butane, pentanal, ethoxyethane; (ii) ethanol, butan-1-ol, propan-1-ol, butan-2-ol.

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

(A) Write the equations for the preparation of (i) propan-2-ol and (ii) propan-1-ol from propene.

OR

(B) Write the equations for the preparation of (i) ethanol and (ii) 2-methylpropan-2-ol from suitable carbonyl compounds using a Grignard reagent.

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

(A) (i) Why is methanol poisonous?
(ii) How is a person poisoned by methanol treated, and why does the treatment work?

OR

(B) (i) What is meant by denaturation of alcohol? Name the substances added.
(ii) Name the two enzymes involved in the fermentation of sugar (sucrose) to ethanol.

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 gives some reactions of alcohols.

No.	Alcohol	Reagent / conditions	Product
1	Ethanol	Conc. H_2SO_4, 443 K	P
2	Ethanol	Conc. H_2SO_4, 413 K	Q
3	Propan-2-ol	Vapours passed over heated Cu, 573 K	R
4	2-Methylpropan-2-ol	Vapours passed over heated Cu, 573 K	S

(i) Identify P and Q.
(ii) Identify R and S.
(iii) Arrange primary, secondary and tertiary alcohols in the order of ease of dehydration. Give a reason.

OR

(B) Write the major organic product in each case:
(i) propan-1-ol treated with pyridinium chlorochromate (PCC)
(ii) phenol treated with chromic acid
(iii) phenol heated with zinc dust

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

(A) Nitration of phenol with dilute HNO_3 at 298 K gives two isomeric products, A and B, shown in Fig. 2 (the dashed lines represent hydrogen bonds).

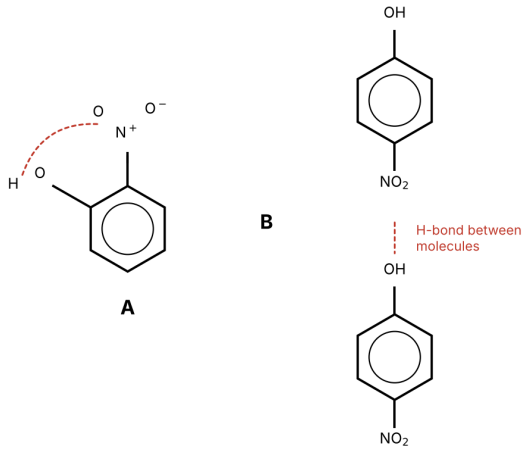
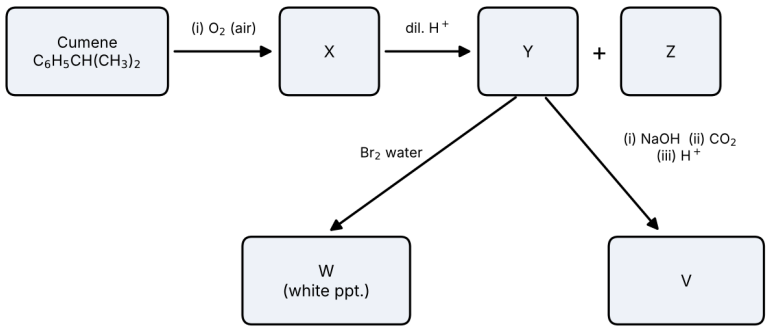


Fig. 2

(i) Name the compounds A and B and name the type of hydrogen bonding in each.
(ii) Which of the two is steam volatile? Why?
(iii) How can the two be separated?

OR

(B) (i) Write the equation for Kolbe's reaction.
(ii) Write the equation for the Reimer–Tiemann reaction.
(iii) Why is the phenoxide ion more reactive than phenol towards electrophilic aromatic substitution?

14	**Attempt either A or B.** **(A)** Fig. 3 shows the commercial preparation of Y from cumene, and two reactions of Y.  **Fig. 3** (i) Identify X, Y and Z. (ii) Name W and write its formation reaction. (iii) Name V and the reaction by which it is obtained. **OR** **(B)** (i) Write the Williamson synthesis for the preparation of ethoxybenzene (phenetole). (ii) The reaction of sodium ethoxide with *tert*-butyl bromide does not give *tert*-butyl ethyl ether. What is formed instead? Why? (iii) Suggest a suitable pair of reactants for *tert*-butyl ethyl ether.	1+1+1
15	**Attempt either A or B.** **(A)** Write the products formed when the following ethers are heated with excess concentrated HI: (i) anisole (methoxybenzene) (ii) *tert*-butyl ethyl ether, $(CH_3)_3COC_2H_5$ (iii) ethyl methyl ether (one mole of HI) **OR** **(B)** Write the equations for the reaction of phenol with (i) bromine in CS_2 at low temperature, (ii) bromine water, (iii) concentrated nitric acid.	1+1+1

SECTION D

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

16 **Acidity of phenols** 1+1+2

Phenols are stronger acids than alcohols, and the acid strength of a substituted phenol depends on the nature and the position of the substituent. The table gives the pK_a values of some phenols and of ethanol.

Compound	Formula	pK_a
o-Nitrophenol	*o*-O_2N–C_6H_4–OH	7.2
m-Nitrophenol	*m*-O_2N–C_6H_4–OH	8.3
p-Nitrophenol	*p*-O_2N–C_6H_4–OH	7.1
Phenol	C_6H_5–OH	10.0
o-Cresol	*o*-CH_3–C_6H_4–OH	10.2
p-Cresol	*p*-CH_3–C_6H_4–OH	10.2
Ethanol	C_2H_5–OH	15.9

Answer the following questions:

(i) Which compound in the table is the strongest acid and which is the weakest? Which is more acidic, phenol or ethanol, and by how many orders of magnitude (powers of 10)?
(ii) Explain why *o*- and *p*-nitrophenols are more acidic than the *m*-isomer.
(iii) **Attempt either A or B.**
(A) Explain why phenol is more acidic than ethanol.
OR
(B) Explain why cresols are less acidic than phenol.

SECTION E

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

17 **Attempt either A or B.** 5

(A) (i) Write the three steps of the mechanism of the acid-catalysed dehydration of ethanol to ethene.
(ii) Which of the steps is the slowest (rate determining)?
(iii) Why is the ethene removed as it is formed?
(iv) At what temperature is ethoxyethane the main product with conc. H_2SO_4? Why is this method not suitable for preparing ethyl methyl ether?

OR

(B) Write the reactions and the reagents/conditions for the oxidation of alcohols that give:
(i) ethanal from ethanol
(ii) ethanoic acid from ethanol
(iii) propanone from propan-2-ol
(iv) propanal from propan-1-ol using copper
(v) the product on passing the vapours of 2-methylpropan-2-ol over heated copper at 573 K

— End of Question Paper —