Master Testing Agency
Practice papers, exam-standard · www.mastertestingagency.com

Alcohols, Phenols and Ethers — CBSE Class 12 Chemistry Chapter Test

FREE CHAPTER TEST · CLASS XII · CHEMISTRY (043) · PATTERN OF THE CBSE SAMPLE QUESTION PAPER 2026-27

TIME ALLOWED	MAXIMUM MARKS	QUESTIONS	NAME / ROLL NO.
1½ hours	37	17 (A 8 · B 3 · C 3 · D 1 · E 2)	

GENERAL INSTRUCTIONS

Read the following instructions very carefully and strictly follow them:

1. This question paper contains 17 questions. All questions are compulsory.
2. This question paper is divided into five sections: A, B, C, D and E.
3. Section A (Q1–8) contains 6 multiple choice questions and 2 assertion-reason based questions of 1 mark each.
4. Section B (Q9–11) contains short answer questions of 2 marks each.
5. Section C (Q12–14) contains short answer questions of 3 marks each.
6. Section D (Q15) contains case-based questions of 4 marks each, with sub-parts of 1, 1 and 2 marks.
7. Section E (Q16–17) contains long answer questions of 5 marks each.
8. There is no overall choice. However, an internal choice has been provided in 1 question in Section B, 1 question in Section C, 1 question in Section D, 2 questions in Section E. Attempt only one of the alternatives in such questions.
9. Use of log tables and calculators is not allowed.
10. This chapter test follows the section structure, question types and marks per question of the CBSE Class XII Chemistry (043) Sample Question Paper 2026-27, at about half the length of the 70-mark board paper: 37 marks in 1½ hours.
11. The answer key and the marking scheme are at the end of this booklet. Attempt the paper in 1½ hours before you look at them.

All questions are original and © Master Testing Agency. Free to download and use for personal practice; not for resale. Master Testing Agency is an independent test-prep publisher, not affiliated with, endorsed by or connected to the Central Board of Secondary Education (CBSE) or any other exam-conducting body.

Chapter: Alcohols, Phenols and Ethers · **Topics:** Nomenclature · Preparation of alcohols and phenols · Physical properties and hydrogen bonding · Acidity of alcohols and phenols · Reactions of alcohols and phenols · Ethers: preparation and reactions

SECTION A

This section comprises 8 questions of 1 mark each: 6 multiple choice questions (MCQs) and 2 assertion-reason based questions.

1. Which reagent reacts with phenol to form sodium phenoxide but does not react with ethanol? 1

(A) Sodium metal
(B) Aqueous sodium hydroxide
(C) Aqueous sodium hydrogencarbonate
(D) Dilute hydrochloric acid

2. Which alcohol gives turbidity at once with Lucas reagent (conc. HCl + anhydrous $ZnCl_2$) at room temperature? 1

(A) Butan-1-ol
(B) Butan-2-ol
(C) 2-Methylpropan-2-ol
(D) Methanol

3. Phenol reacts with bromine water to give a white precipitate of 1

(A) 2,4,6-tribromophenol
(B) 2-bromophenol
(C) 4-bromophenol
(D) bromobenzene

4. Phenol is heated with chloroform and aqueous sodium hydroxide, and the product is acidified. The main product is 1

(A) salicylic acid
(B) benzoic acid
(C) chlorobenzene
(D) salicylaldehyde

5. Methoxybenzene (anisole) is heated with HI. The products are 1

(A) iodobenzene and methanol
(B) iodobenzene and iodomethane
(C) phenol and iodomethane
(D) benzene and methanol

6. In the manufacture of phenol from cumene, the other product formed is 1

(A) propanone (acetone)
(B) ethanal
(C) benzene
(D) propene

7. **Assertion (A) :** Phenol is a weaker acid than ethanol. 1
Reason (R) : The phenoxide ion is stabilised by resonance.

(A) Both A and R are true, and R is the correct explanation of A.
(B) Both A and R are true, and R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

8. **Assertion (A) :** Ethers have lower boiling points than isomeric alcohols. 1
Reason (R) : Ethers can be prepared by the Williamson synthesis.

(A) Both A and R are true, and R is the correct explanation of A.
(B) Both A and R are true, and R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

SECTION B

This section comprises 3 short answer questions of 2 marks each.

9. Write the IUPAC names of (i) $CH_3CH(OH)CH(CH_3)CH_3$ and (ii) $C_6H_5OCH_2CH_3$. 2

10. (a) Why do alcohols have much higher boiling points than ethers and hydrocarbons of comparable molecular mass? Why are the lower alcohols soluble in water? 2

OR

(b) Write the equation for Kolbe's reaction and name the final product.

11. Write the equations for the reaction of phenol with (i) zinc dust and (ii) concentrated nitric acid. 2

SECTION C

This section comprises 3 short answer questions of 3 marks each.

12. (a) Write the equations for the preparation of (i) propan-1-ol from propene by hydroboration-oxidation, (ii) propan-2-ol from propene by acid-catalysed hydration, and (iii) propan-1-ol by the reduction of propanal with $NaBH_4$. 3

OR

(b) Using methylmagnesium bromide and a suitable carbonyl compound, show how you would prepare (i) propan-2-ol, (ii) 2-methylpropan-2-ol and (iii) ethanol.

13. Arrange ethanol, phenol, 4-nitrophenol and 4-methylphenol in order of increasing acid strength, and explain the order. 3

14. Write the mechanism of the acid-catalysed dehydration of ethanol to ethene at 443 K. 3

SECTION D

This section comprises 1 case-based question of 4 marks, with sub-parts of 1, 1 and 2 marks.

15. Aspirin is one of the most widely used medicines. It is made from phenol in two stages. First, sodium phenoxide is heated with carbon dioxide under pressure and then acidified, giving salicylic acid (2-hydroxybenzoic acid). Then salicylic acid is treated with ethanoic anhydride, which converts its phenolic –OH group into an ester group, giving acetylsalicylic acid (aspirin).

(I) Name the reaction that converts sodium phenoxide into salicylic acid. [1]

(II) Name the two functional groups present in salicylic acid. [1]

(III) Write the equation for the conversion of salicylic acid into aspirin with ethanoic anhydride. What type of reaction is it? [2]

OR

(III) Phenol reacts with dilute nitric acid to give a mixture of 2-nitrophenol and 4-nitrophenol. Which of them is steam volatile? Explain why. [2]

SECTION E

This section comprises 2 long answer questions of 5 marks each.

16. (a) (i) Write the equations for the preparation of phenol from (I) chlorobenzene, (II) benzenesulphonic acid and (III) benzenediazonium chloride. 5

(ii) Give reasons: (I) the C–O bond in phenol is shorter than in methanol; (II) phenol undergoes electrophilic substitution more readily than benzene.

OR

(b) (i) What are the products of the oxidation of primary, secondary and tertiary alcohols? Give one equation for each type, and state what happens to each type when its vapour is passed over hot copper at 573 K.

(ii) Give two chemical tests to distinguish phenol from ethanol.

17. (a) (i) Describe the Williamson synthesis of ethers, with an equation. Why must 2-methoxy-2-methylpropane be made from sodium tert-butoxide and bromomethane, and not from sodium methoxide and 2-bromo-2-methylpropane? 5

(ii) Write the products of the reaction of 2-methoxy-2-methylpropane with hot concentrated HI, and explain why they are formed.

(iii) Write the main products of the nitration of anisole.

OR

(b) (i) Explain how the Lucas test distinguishes primary, secondary and tertiary alcohols, with the equation for the tertiary alcohol 2-methylpropan-2-ol.

(ii) Write the equation for the esterification of ethanol with ethanoic acid. Why is the water formed removed as the reaction proceeds?

END OF THE QUESTION PAPER

ANSWER KEY — SECTION A

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
(B)	(C)	(A)	(D)	(C)	(A)	(D)	(B)

MARKING SCHEME AND WORKED SOLUTIONS

Marks for each step are shown in brackets, as in the CBSE marking scheme. Any correct alternative method earns full marks.

Q1. Answer (B). Phenol is acidic enough to be neutralised by NaOH but too weak to react with $NaHCO_3$; ethanol is too weak an acid to react with NaOH, while sodium metal reacts with both.

Q2. Answer (C). Tertiary alcohols react at once (stable tertiary carbocation).

Q3. Answer (A). In water the strongly activated ring is brominated at all the ortho and para positions.

Q4. Answer (D). Reimer-Tiemann reaction: a –CHO group enters the ortho position.

Q5. Answer (C). The O–CH_3 bond breaks (attack of I^- on the methyl carbon); the aryl–O bond has partial double bond character.

Q6. Answer (A). Cumene hydroperoxide is cleaved by dilute acid into phenol and propanone.

Q7. Answer (D). Because the phenoxide ion is resonance-stabilised (and ethoxide is not), phenol is the stronger acid: A is false, R is true. Answer D.

Q8. Answer (B). Both are true; the boiling points are explained by the absence of hydrogen bonding between ether molecules, not by how ethers are made. Answer B.

Q9. (2 marks) Answer: 3-methylbutan-2-ol; ethoxybenzene.
(i) 3-Methylbutan-2-ol. [1]
(ii) Ethoxybenzene. [1]

Q10. (2 marks) Answer: (a) hydrogen bonding; (b) salicylic acid.
(a) Alcohol molecules are associated through intermolecular hydrogen bonds (–O–H···O), which need extra energy to break. [1] Lower alcohols form hydrogen bonds with water molecules. [1]
OR (b) $C_6H_5ONa + CO_2$ → (400 K, 4–7 atm) sodium salicylate; with dilute acid → salicylic acid (2-hydroxybenzoic acid). [1½] Product: salicylic acid. [½]

Q11. (2 marks) Answer: benzene; picric acid.
(i) $C_6H_5OH + Zn \rightarrow C_6H_6 + ZnO$ (benzene). [1]
(ii) $C_6H_5OH + 3HNO_3$ (conc.) → 2,4,6-trinitrophenol (picric acid) + $3H_2O$. [1]

Q12. (3 marks) Answer: (a) propan-1-ol, propan-2-ol, propan-1-ol; (b) ethanal, propanone, methanal with CH_3MgBr.
(a) (i) $6CH_3CH{=}CH_2 + B_2H_6 \rightarrow 2(CH_3CH_2CH_2)_3B$; $(CH_3CH_2CH_2)_3B + 3H_2O_2$ (NaOH) → $3CH_3CH_2CH_2OH + B(OH)_3$ (anti-Markovnikov product). [1]
(ii) $CH_3CH{=}CH_2 + H_2O$ (H^+) → $CH_3CH(OH)CH_3$ (Markovnikov). [1]
(iii) $CH_3CH_2CHO + 2[H]$ ($NaBH_4$) → $CH_3CH_2CH_2OH$. [1]
OR (b) (i) $CH_3CHO + CH_3MgBr \rightarrow (CH_3)_2CHOMgBr$; hydrolysis → $(CH_3)_2CHOH$. [1]
(ii) $CH_3COCH_3 + CH_3MgBr \rightarrow (CH_3)_3COMgBr$; hydrolysis → $(CH_3)_3COH$. [1]
(iii) $HCHO + CH_3MgBr \rightarrow CH_3CH_2OMgBr$; hydrolysis → CH_3CH_2OH. [1]

Q13. (3 marks) Answer: ethanol < 4-methylphenol < phenol < 4-nitrophenol.
Ethanol < 4-methylphenol < phenol < 4-nitrophenol. [1]
Phenols are more acidic than ethanol because the phenoxide ion is stabilised by delocalising its charge over the ring. [1]
The electron-withdrawing $–NO_2$ group spreads the negative charge further (more acidic); the electron-releasing $–CH_3$ group intensifies it (less acidic). [1]

Q14. (3 marks) Answer: protonation; carbocation (slow); loss of H^+.
Step 1: protonation of the alcohol: $CH_3CH_2–OH + H^+ \rightarrow CH_3CH_2–OH_2^+$ (fast). [1]
Step 2: loss of water to form the carbocation: $CH_3CH_2–OH_2^+ \rightarrow CH_3CH_2^+ + H_2O$ (slow, rate-determining). [1]
Step 3: loss of a proton: $CH_3CH_2^+ \rightarrow CH_2=CH_2 + H^+$. [1]

Q15. (4 marks) Answer: (I) Kolbe; (II) –OH and –COOH; (III) acetylation, or 2-nitrophenol.
(I) Kolbe's reaction. [1]
(II) Phenolic hydroxyl (–OH) and carboxylic acid (–COOH). [1]
(III) $2\text{-}HOC_6H_4COOH + (CH_3CO)_2O \rightarrow 2\text{-}CH_3COOC_6H_4COOH$ (aspirin) + CH_3COOH. [1] Acetylation (esterification of the phenolic –OH). [1]
OR (III) 2-Nitrophenol. [1] It has intramolecular hydrogen bonding (between –OH and the neighbouring $–NO_2$), so its molecules are not associated; 4-nitrophenol has intermolecular hydrogen bonding, which raises its boiling point. [1]

Q16. (5 marks) Answer: (a) Dow process, fusion with NaOH, hydrolysis of diazonium salt; resonance; (b) PCC / $KMnO_4$; $FeCl_3$ test.
(a) (i) (I) $C_6H_5Cl + 2NaOH$ (623 K, about 300 atm) $\rightarrow C_6H_5ONa + NaCl + H_2O$; then $C_6H_5ONa + HCl \rightarrow C_6H_5OH + NaCl$. [1] (II) Fusion with NaOH: $C_6H_5SO_3H + 3NaOH \rightarrow C_6H_5ONa + Na_2SO_3 + 2H_2O$; then dilute acid gives C_6H_5OH. [1] (III) $C_6H_5N_2^+Cl^- + H_2O$ (warm) $\rightarrow C_6H_5OH + N_2 + HCl$. [1]
(ii) (I) In phenol the oxygen is attached to an sp^2 carbon, and its lone pair is partly delocalised into the ring, giving the C–O bond some double bond character. [1] (II) The –OH group releases electrons into the ring by resonance, raising the electron density at the ortho and para positions, so electrophiles attack more easily. [1]
OR (b) (i) Primary alcohols: PCC (or CrO_3 in anhydrous medium) gives aldehydes, e.g. $CH_3CH_2OH \rightarrow CH_3CHO$; acidified $KMnO_4$ gives carboxylic acids, $CH_3CH_2OH \rightarrow CH_3COOH$. [1] Over hot Cu at 573 K a primary alcohol is dehydrogenated to the aldehyde: $CH_3CH_2OH \rightarrow CH_3CHO + H_2$. [1] Secondary alcohols give ketones, with CrO_3 or over hot Cu (dehydrogenation): $CH_3CH(OH)CH_3 \rightarrow CH_3COCH_3 + H_2$. Tertiary alcohols resist oxidation; over hot Cu at 573 K they are dehydrated to alkenes, e.g. $(CH_3)_3COH \rightarrow (CH_3)_2C=CH_2 + H_2O$. [1]
(ii) Neutral $FeCl_3$ solution: phenol gives a violet colour, ethanol none. [1] Bromine water: phenol gives a white precipitate (2,4,6-tribromophenol), ethanol does not. [1]

Q17. (5 marks) Answer: (a) tertiary halides eliminate; $(CH_3)_3CI + CH_3OH$; 2- and 4-nitroanisole; (b) Lucas test; ethyl ethanoate.
(a) (i) An alkyl halide reacts with a sodium alkoxide by S_N2: $R–X + R'ONa \rightarrow R–O–R' + NaX$. [1] With a tertiary halide and a strong base, elimination wins (giving 2-methylpropene), so the halide must be primary: $(CH_3)_3CONa + CH_3Br \rightarrow (CH_3)_3COCH_3 + NaBr$. [1]
(ii) $(CH_3)_3CI$ and CH_3OH. [1] The protonated ether breaks to give the stable tert-butyl carbocation (S_N1), which takes up I^-. [1]
(iii) 2-Methoxynitrobenzene and 4-methoxynitrobenzene (para major); $–OCH_3$ is an o,p-director. [1]
OR (b) (i) Lucas reagent (conc. HCl + anhydrous $ZnCl_2$) converts alcohols into alkyl chlorides, which are insoluble and make the solution cloudy. [1] Tertiary: cloudiness at once; secondary: in about 5 minutes; primary: no cloudiness at room temperature (only on heating). [1] $(CH_3)_3COH + HCl \rightarrow (CH_3)_3CCl + H_2O$. [1]
(ii) $CH_3CH_2OH + CH_3COOH \rightleftharpoons CH_3COOCH_2CH_3 + H_2O$ (conc. H_2SO_4). [1] The reaction is reversible; removing water as it forms shifts the equilibrium to the ester side. [1]

All questions are original and © Master Testing Agency. Free to download and use for personal practice; not for resale. Every formula and every equation in this paper was checked independently by computer from the structures, for the balance of atoms.