



Attempt all questions before checking the answer key. Write reagents, temperature where essential and structural formulae. Distinguish major products from mixtures.

A. Very short answers - 1 mark each

1. Classify $\text{CH}_3\text{CH}(\text{OH})\text{CH}_3$ as primary, secondary or tertiary alcohol.
2. Why is phenol more acidic than ethanol?
3. Name $\text{CH}_3\text{OCH}_2\text{CH}_3$ by IUPAC rules.
4. What is Williamson ether synthesis?
5. Give one chemical test for phenol.
6. Which C-O bond of anisole is usually cleaved by HI: aryl-O or methyl-O?

B. Short answers / practice - 2 marks each

7. Write reactions of ethanol with sodium and with acidified potassium dichromate under complete oxidation.
8. Why does ethanol have a higher boiling point than dimethyl ether?
9. Write dehydration of ethanol to ethene and to diethyl ether, with contrasting conditions.
10. Explain why phenol reacts with NaOH but ethanol does not appreciably do so in aqueous solution.
11. Write the reaction of phenol with bromine water and state the observation.
12. Write the cleavage of ethoxyethane with excess HI on heating.
13. Can phenol liberate CO_2 from aqueous NaHCO_3 under ordinary conditions?
14. Name $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$.
15. Find moles of H_2 formed from 2 mol ethanol with excess Na.
16. Is tert-butyl alcohol a tertiary alcohol?
17. Predict product of anisole with HI under cleavage conditions.
18. Explain why phenol gives a white precipitate with bromine water.

C. Short answers - 3 marks each

19. Explain acid-catalysed dehydration of ethanol to ethene using a suitable mechanism.

20. Give the products of phenol nitration with dilute and concentrated nitric acid, and explain orientation.

21. Write Kolbe's reaction and Reimer-Tiemann reaction of phenol, including work-up.

22. Convert propanone to propan-2-ol, phenol to benzene and ethanol to ethoxyethane, giving reagents.

23. Explain why tert-butyl methyl ether is better prepared from sodium tert-butoxide and methyl iodide than from sodium methoxide and tert-butyl bromide.

24. Compare acidity of phenol, p-nitrophenol and p-methylphenol using electronic effects.

D. Long answers - 5 marks each

25. Describe preparation of alcohols by alkene hydration, carbonyl reduction and Grignard addition followed by hydrolysis. Give reactions yielding primary, secondary and tertiary alcohols.

26. Explain the acidic character of phenol using resonance. Compare substituent effects of $-\text{NO}_2$ and $-\text{CH}_3$ and write reactions of phenol with Na, NaOH and bromine water.

27. Give reaction sequences with reagents: phenol to salicylaldehyde, phenol to salicylic acid, anisole to phenol, and ethanol to ethanoic acid.

28. Explain Williamson synthesis and its limitations. Show preparation of anisole and ethoxyethane, and explain why an aryl halide cannot replace the alkyl halide in the usual $\text{S}_\text{N}2$ route.

29. An alcohol $\text{C}_3\text{H}_8\text{O}$ gives propanone on oxidation. Identify it; write its dehydration, sodium reaction and oxidation. Explain how its oxidation behaviour distinguishes it from propan-1-ol.

30. Compare reactions of anisole with HI, Br_2 in ethanoic acid and $\text{CH}_3\text{Cl}/\text{anhydrous AlCl}_3$. Write products and explain why the methoxy group directs electrophilic substitution to ortho and para positions.

ANSWER KEY - Numerical / short answers

13) No; it is weaker than carbonic acid. 14) Propan-1-ol. 15) 1 mol. 16) Yes. 17) Phenol and CH_3I . 29) Propan-2-ol; dehydration gives propene; oxidation gives propanone; Na releases H_2 .