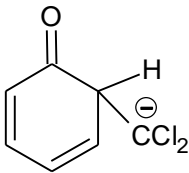
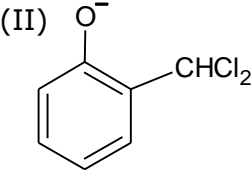
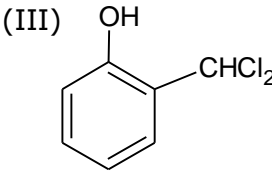
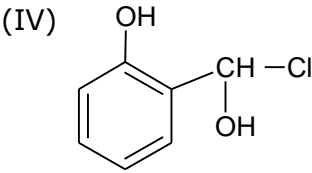
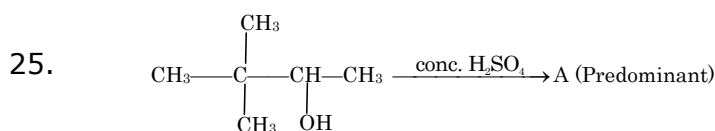


ALCOHOLS, PHENOLS & ETHERS
II PUC CHEMISTRY

- The intermediate species involved in the acid catalysed dehydration of alcohol is
a) Free radical b) Carbocation c) Carbanion d) Carbene
- Which of the following reactants are used in the preparation of methyl-t-butyl ether?
a) $(\text{C}_2\text{H}_5)_3\text{CONa} + \text{CH}_3\text{Cl}$ b) $\text{CH}_3\text{ONa} + (\text{CH}_3)_3\text{CCl}$
c) $(\text{CH}_3)_3\text{CONa} + \text{C}_2\text{H}_5\text{Cl}$ d) $(\text{CH}_3)_3\text{CONa} + \text{CH}_3\text{Cl}$
- Oxymercuration-demercuration of $\text{CH}_3\text{CH} = \text{CH}_2$ produces
a) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$ b) $\text{CH}_3\text{CH}(\text{OH})\text{CH}_3$
c) $\text{CH}_3\text{CH}(\text{OH})\text{CH}_2\text{OH}$ d) $\text{CH}_3\text{COHCH}_3$
- The reaction CH_3COCH_3 with RMgX produces
a) 1° alcohol b) 2° alcohol
c) 3° alcohol d) a carboxylic acid
- Which of the following statements is not correct?
a) The addition of water to the carbon-carbon double bond via hydroboration-oxidation process does not involve any rearrangement of carbon skeleton.
b) The rearrangement of carbon skeleton may occur during the conversion of alcohol into alkene
c) The rearrangement of carbon skeleton may occur during the conversion of alcohol into alkyl halide
d) The cleavage of carbon-oxygen bond in alcohols is not catalyzed in the presence of an acid.
- Which of the following statements is not correct?
a) The substitution of hydroxyl group by a halogen group in alcohol is an electrophilic substitution reaction
b) Alcohols are weak acids as well as weak bases
c) A secondary alcohol on oxidation gives a carboxylic acid containing the lesser number of carbon atoms
d) A primary alcohol on oxidation gives a carboxylic acid containing the same number of carbon atoms.
- The iodoform test is not shown by the compound
a) CH_3COCH_3 b) $\text{CH}_3\text{COCH}_2\text{CH}_3$ c) $\text{CH}_3\text{CH}_2\text{COCH}_2\text{CH}_3$ d) $(\text{CH}_3)_2\text{CHOH}$
- Reaction of tertiary butyl alcohol with hot Cu at 350°C produces
a) butanol b) butanal
c) 2-butene d) 2-methylpropene
- Phenol ($\text{C}_6\text{H}_5\text{OH}$) reacts with dilute FeCl_3 solution to give $\text{H}_3[\text{Fe}(\text{O} - \text{C}_6\text{H}_5)_3]$, whose colour is:
a) green b) dark red c) violet d) blue
- Salol antiseptic is prepared by the reaction of salicylic acid with:
a) CH_3OH b) $\text{C}_6\text{H}_5\text{OH}$ c) $\text{C}_2\text{H}_5\text{OH}$ d) $\text{C}_6\text{H}_5\text{CH}_2\text{OH}$

11. Which one of the following cannot be obtained from a mixture of ethanol and concentrated sulphuric acid, if the composition of the mixture and the reaction conditions are suitably adjusted?
 a) C_2H_4 b) CH_3CHO c) $CH_3CH_2OCH_2CH_3$ d) $CH_3CH_2HSO_4$
12. Which of the following statements is not true?
 a) When vapours of phenol are passed over Zn dust, benzene is formed
 b) The phenolic -OH group is meta directing group
 c) The phenolic -OH group is ortho-and para directing group
 d) o-nitrophenol has a lower boiling point as compared to that of p-nitrophenol
13. The bromination of phenol in aqueous medium produces
 a) 2-bromophenol b) 4-bromophenol
 c) 2,4,6-tribromophenol d) a mixture of 2- and 4-bromophenols
14. The reaction of $PhOCH_2CH_3$ with one equivalent of HI produces
 a) $Ph-I + CH_3CH_2OH$ b) $Ph-I + CH_3CH_3$
 c) $C_6H_6 + ICH_2CH_3$ d) $Ph-OH + ICH_2CH_3$
15. Which of the following statements is not correct?
 a) Phenol reacts with CCl_4 in the presence of NaOH solution at $70^\circ C$ to give salicylic acid
 b) Phenol reacts with phthalic anhydride in the presence of concentrated H_2SO_4 forming phenolphthalein which is used as acid-base indicator
 c) Phenol on exposure to air produces a red coloured product known as phenoquinone
 d) The treatment of concentrated H_2SO_4 at $15 - 20^\circ C$ with phenol produces p-phenolsulphonic acid whereas at $100^\circ C$, o-phenolsulphonic acid is produced.
16. $CH_3OH \xrightarrow{PI_3} (A) \xrightarrow{KCN} (B) \xrightarrow{\text{Hydrolysis}} (C)$, the compound 'C' is
 a) CH_3OH b) $HCOOH$ c) CH_3CHO d) CH_3COOH
17. A phenolic compound (A), $C_7H_8O_2$ on mild oxidation gives a highly volatile (B). (A) forms (C) on reaction with dimethyl sulphate in alkali. Oxidation of (C) with hot $KMnO_4$ gives (D) which when reacts with bromine water gives (E) containing about 72% bromine. Identify the product (E).
 a) ortho-bromophenol b) para bromophenol
 c) 2,4,6 tribromophenol d) both (a) and (b)
18. Phenol is heated with NaOH and $CHCl_3$ to prepare salicylaldehyde. Which of the following products are formed as intermediates?
- (I) 
- (II) 
- (III) 
- (IV) 
- a) I, II b) II, III c) III, IV d) I, IV

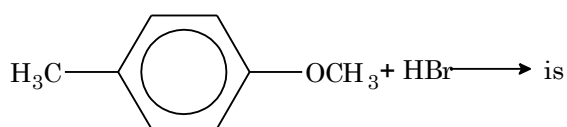
19. An aromatic compound (A) on acetylation gave a product (B) of molecular mass 136. When (A) is refluxed with CHCl_3 and NaOH , two products (C) and (D) are obtained. The product (D) can be separated by steam distillation and upon oxidation gives an acid (E). Acid (E) can be obtained by heating (A) with CO_2 and NaOH . Identify (A) (B) and (E).
- Benzyl alcohol, benzyl salicylate and salicylic acid
 - Cresol, phenyl acetate and salicylic acid
 - Phenol, methyl phenyl ether and salicylic acid
 - Phenol, phenyl acetate and salicylic acid
20. An organic compound (X) with molecular formula $\text{C}_7\text{H}_8\text{O}$ is insoluble in aqueous NaHCO_3 but dissolves in NaOH . When treated with bromine water (X) rapidly gives (Y), $\text{C}_7\text{H}_5\text{OBr}_3$. The compounds (X) and (Y) respectively are
- benzyl alcohol and 2,4,6-tribromo-3-methoxy benzene
 - o-cresol and 3,4,5-tribromo-2-methyl phenol
 - methoxy benzene and 2,4,6-tribromo-3-methoxy benzene
 - m-cresol and 2,4,6-tribromo-3-methoxy phenol
21. Reimer – Tiemann reaction involves an intermediate:
- carbonium ion
 - carbanion
 - free radical
 - carbene
22. Which of the following statements is not true?
- Phenol is a weak acid
 - Phenol is soluble in NaOH
 - Phenol liberates CO_2 from Na_2CO_3 solution
 - Phenol gives violet colouration with neutral FeCl_3
23. Which one/ones of the following reactions will yield propan-2-ol?
- (i) $\text{CH}_3\text{CH} = \text{CH}_2 + \text{H}_2\text{O} \xrightarrow{\text{H}^+}$ (ii) $\text{CH}_3\text{CHO} \xrightarrow[\text{(ii) H}_2\text{O}]{\text{(i) CH}_3\text{MgI}}$
- (iii) $\text{HCHO} \xrightarrow[\text{(ii) H}_2\text{O}]{\text{(i) C}_2\text{H}_5\text{MgI}}$ (iv) $\text{CH}_3\text{CH} = \text{CH}_2 \xrightarrow{\text{Neutral KMnO}_4}$
- Choose the right answer
- (i) and (ii)
 - (ii) and (iii)
 - (iii) and (i)
 - (ii) and (iv)
24. A compound 'X' undergoes reduction with LiAlH_4 to yield 'Y'. When vapours of 'Y' are passed over freshly reduced copper at 300°C , 'X' is formed. What is 'Y'?
- CH_3COCH_3
 - CH_3CHO
 - $\text{CH}_3\text{CH}_2\text{OH}$
 - CH_3OCH_3



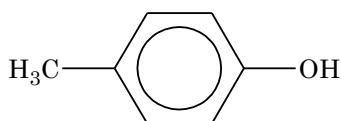
A is

- $(\text{CH}_3)_3\text{C}-\text{CH}=\text{CH}_2$
- $(\text{CH}_3)_2\text{C}=\text{C}(\text{CH}_3)_2$
- $\text{CH}_2=\text{C}-\text{CH}_2-\text{CH}_2\text{CH}_3$
- none of the above

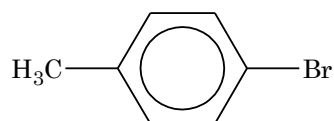
26. The final product obtained in the reaction



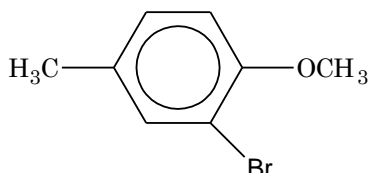
a)



b)



c)



d) None of these

27. In the cumene process to manufacture phenol the chemicals used are

a) benzene and propene

b) benzene and oxygen

c) benzene and sodium hydroxide

d) chlorobenzene and NaOH

28. Acidity of phenol is due to

a) its aromatic character

b) the presence of -OH group

c) resonance stabilization of phenate ion

d) electron donor character of phenyl group

29. Catalytic hydrogenation of phenol gives

a) Cyclohexane

b) Cyclohexanol

c) Cyclohexene

d) benzene

30. m-chlorotoluene is heated with NaOH to 300° C under 200 atms pressure. The product obtained is

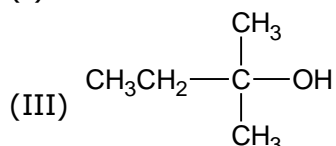
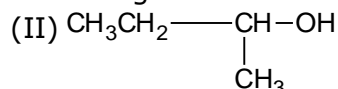
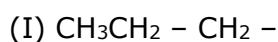
a) m-cresol

b) resorcinol

c) m-hydroxyphenol

d) phenol

31. The order of reactivity of following alcohols with halogen acids is



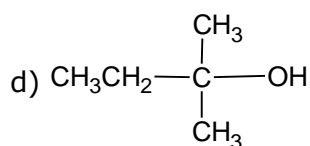
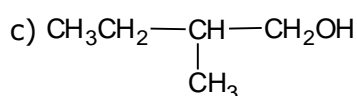
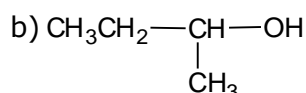
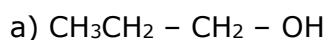
a) (I) > (II) > (III)

b) (III) > (II) > (I)

c) (II) > (I) > (III)

d) (I) > (III) > (II)

32. Which of the following alcohols will yield the corresponding alkyl chloride on reaction with concentrated HCl at room temperature?



33. When vapours of isopropyl alcohol is passed over heated copper we get acetone, it is an example for

- a) dehydration
b) dehalogenation
c) dehydrohalogenation
d) dehydrogenation

34. An organic compound 'A' containing C, H and O has a pleasant odour with boiling point of 78°C. On boiling 'A' with conc. H₂SO₄, a colourless gas is produced which decolourises bromine water and alkaline KMnO₄. The organic liquid A is

- a) C₂H₅Cl
b) C₂H₅COOCH₃
c) C₂H₅OH
d) C₂H₆

35. The reaction, water gas (CO + H₂) + H₂ 673K, 300 atmosphere in presence of the catalyst Cr₂O₃ / ZnO is used for the manufacture of

- a) HCHO
b) HCOOH
c) CH₃OH
d) CH₃COOH

36. In the following sequence of reaction $\text{CH}_3\text{CH}_2\text{OH} \xrightarrow{\text{P+I}_2} \text{A} \xrightarrow[\text{ether}]{\text{Mg}} \text{B} \xrightarrow{\text{HCHO}} \text{C} \xrightarrow{\text{H}_2\text{O}} \text{D}$ The compound D is

- a) propanol
b) butanol
c) n-butyl alcohol
d) n-propyl alcohol

37. The most suitable reagent for the conversion of RCH₂OH → RCHO is

- a) KMnO₄
b) K₂Cr₂O₇
c) C₅H₆N + HCl + CrO₃
d) C₅H₅N + HCl + CrO₃

38. Which bond of ethyl alcohol undergoes cleavage during its reaction with sodamide?

- a) C – C
b) C – O
c) C – H
d) O – H

39. How many isomers of C₅H₁₁OH will be primary alcohols?

- a) 5
b) 2
c) 4
d) 3

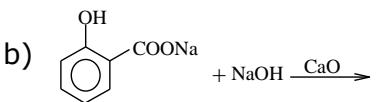
40. The enzyme which can catalyse the conversion of glucose to ethanol is

- a) Zymase
b) Invertase
c) Maltase
d) Diastase

41. A compound X with molecular formula C₃H₈O can be oxidised to a compound Y with the molecular formula C₃H₆O₂. X is most likely to be

- a) Primary alcohol
b) Secondary alcohol
c) Aldehyde
d) Ketone

42. Phenol cannot be obtained by one of the following reactions

- a) $\text{C}_6\text{H}_5\text{N}_2^+\text{Cl}^- + \text{H}_2\text{O} \xrightarrow{\text{dil. H}_2\text{SO}_4}$
b) 
c) $\text{C}_6\text{H}_5\text{Cl} + \text{NaOH} \xrightarrow[\text{(ii) Dil. HCl}]{\text{(i) 633 K, 200 atm}}$
d) $\text{C}_6\text{H}_5\text{MgBr} + \text{H}_2\text{O} \xrightarrow{\text{Dil. HCl}}$

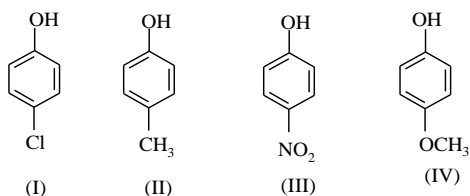
43. RCH₂CH₂OH can be converted to RCH₂CH₂COOH by the following sequence to steps

- a) PBr₃, KCN, H₃O⁺
b) PBr₃, KCN, H₂/Pt
c) KCN, H₃O⁺
d) HCN, PBr₃, H₃O⁺

44. Schotten Baumann reaction is

- a) Phenol + Benzoyl chloride $\xrightarrow{\text{NaOH}}$ phenyl benzoate
b) Sodium phenate + methyl iodide $\xrightarrow{-\text{HCl}}$ Anisole
c) Phenol + Chloroform $\xrightarrow{\text{NaOH}}$ Salicylaldehyde
d) Benzene diazonium chloride + Phenol \rightarrow β -Hydroxyazobenzene

45. Arrange the following compounds in order of decreasing acidity :

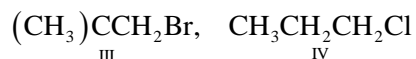
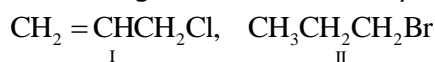


- a) III > I > II > IV b) IV > III > I > II c) II > IV > I > III d) I > II > III > IV

46. Ortho-Nitrophenol is less soluble in water than p and m-nitrophenols because

- a) o-nitrophenol is more volatile in steam than those of m- and p-isomers
b) o-nitrophenol shows intramolecular H-bonding
c) o-nitrophenol shows intermolecular H-bonding
d) melting point of o-nitrophenol is lower than those of m and p-isomer

47. Increasing order of reactivity of the following alkyl halides in the Williamson's synthesis is



- a) II < III < IV < I b) III < II < IV < I c) IV < III < I < II d) III < IV < II < I

48. When phenol is treated with CHCl_3 and NaOH the product formed is

- a) benzaldehyde b) salicylaldehyde c) salicylic acid d) benzoic acid

49. m-dihydroxybenzene is also called

- a) Catechol b) Resorcinol c) Quinol d) Pyrogallol

50. Ethyl acetate reacts with excess of CH_3MgBr to form

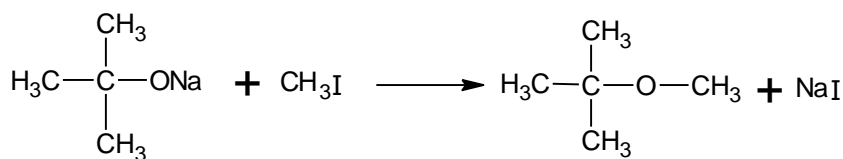
- a) Secondary alcohol b) Tertiary alcohol
c) Primary alcohol and an acid d) An acid

Key answer & solution

1. Ans: (b)

In the dehydration of alcohol, the intermediate ion is a carbocation.

2. Ans:(d)



3. Ans:(b)

Addition follows Markovnikov's rule

4. Ans:(c)

CH_3COCH_3 produces 3° alcohol with RMgX

5. Ans:(d)

b) This is because of the formation of carbocation as the intermediate

c) This is because of the formation of carbocation as the intermediate

d) In the presence of an acid, alcohol gives protonated alcohol. The later readily loses the weakly basic water molecule leaving behind the carbocation. The unprotonated alcohol would have to lose the strongly basic hydroxide ion, which is difficult to take place

6. Ans:(a)

a) Replacement of $-\text{OH}$ by a halogen in an alcohol is nucleophilic substitution reaction. It is the protonated alcohol which acts as a substrate.

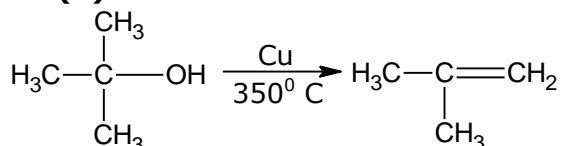
b) Alcohols are acidic enough to react with active metals to liberate hydrogen gas. They are basic enough to accept a proton from strong acids.

c) It gives a ketone containing the same number of carbon atoms. Further oxidation will give carboxylic acid containing lesser number of carbon atoms.

7. Ans: (c)

The iodoform test will be shown by a molecule containing $-\text{COCH}_3$ group or by a molecule producing this group on oxidation. The compound $\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3$ will not show iodoform test.

8. Ans:(d)



9. Ans:(c)

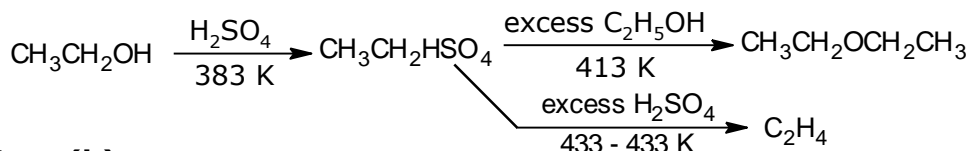
Violet colour due to the formation of complex compound.

10. Ans: (b)

Salol is phenyl salicylate

11. Ans: (b)

Other three compounds, viz $\text{CH}_3\text{CH}_2\text{HSO}_4$, C_2H_4 and $\text{CH}_3\text{CH}_2\text{OC}_2\text{H}_5$ are formed.



12. Ans: (b)

Phenolic $-\text{OH}$ group is ortho - and para- directing

13. Ans:(c)

In aqueous medium, trisubstituted phenol is obtained

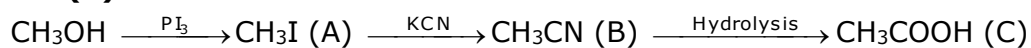
14. Ans:(d)

Aryl ethers do not cleave on the aromatic side, but only on the alkyl side

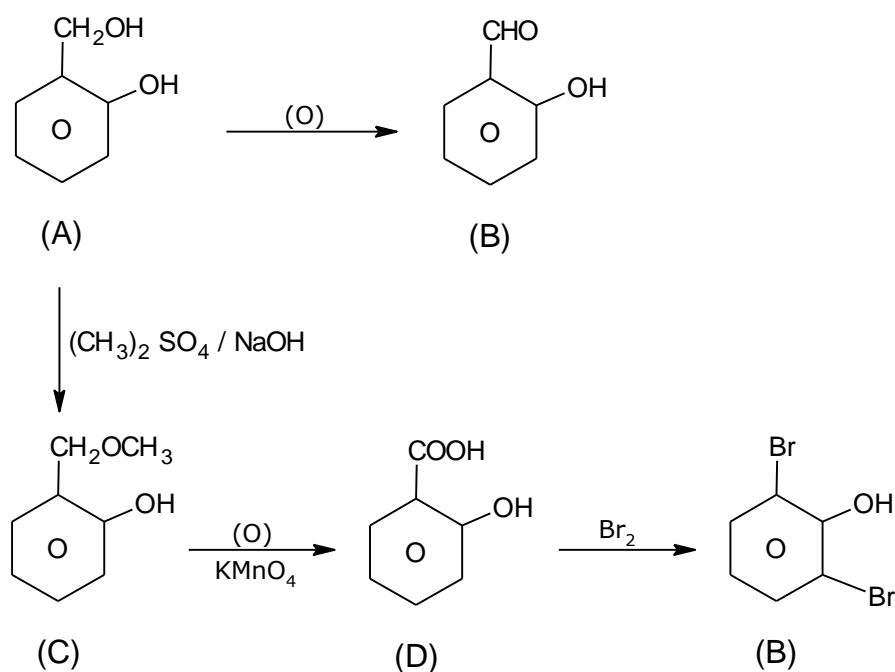
15. Ans:(d)

At low temperature, o-phenolsulphonic acid is formed which is converted into p-phenolsulphonic acid at higher temperature.

16. Ans:(d)

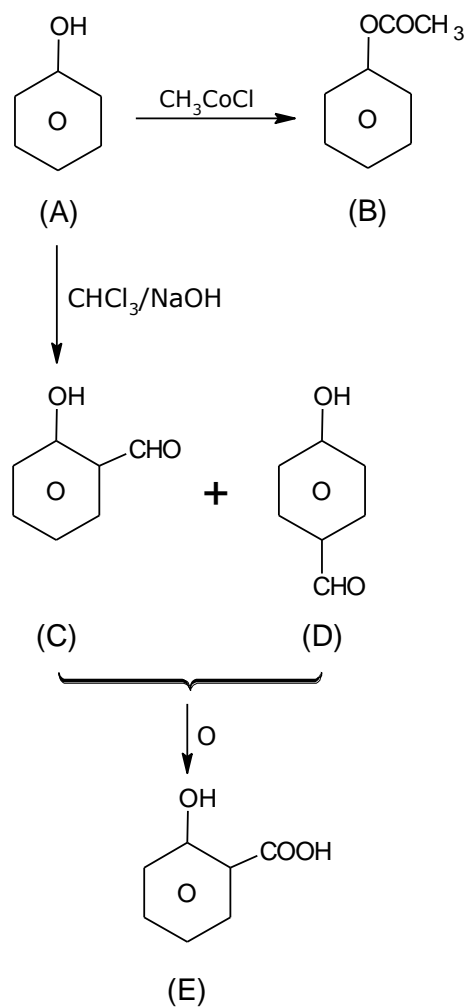


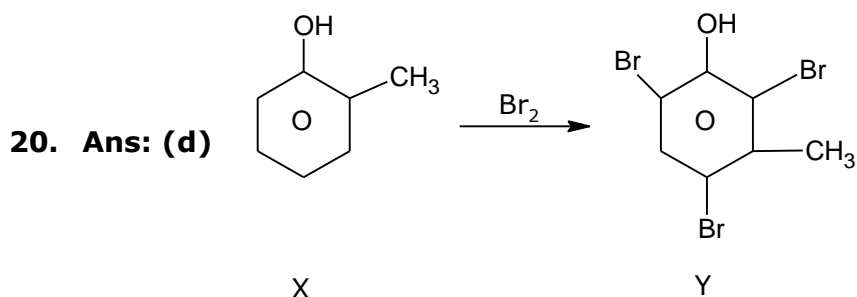
17. Ans: (c)



18. Ans: (a)

19. Ans: (d)





21. Ans: (d)

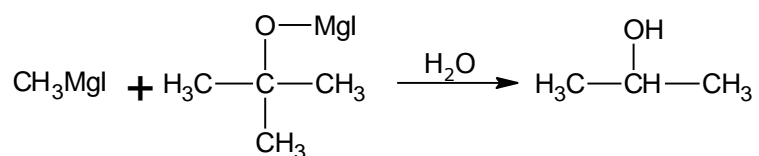
Carbene, $\text{CHCl}_3 + \text{OH}^- \rightleftharpoons \text{:CCl}_3^- + \text{H}_2\text{O}$ $\text{:CCl}_3^- \rightleftharpoons \text{:CCl}_2 + \text{Cl}^-$

In the Reimer-Tiemann reaction, the electrophile used is :CCl_2 (dichlorocarbene), an electron deficient species.

22. Ans: (c)

Phenol being a very weak acid does not liberate CO_2 from Na_2CO_3

23. Ans: (a)



24. Ans: (c)

$\text{CH}_3\text{CHO}(\text{X}) + [\text{H}] \xrightarrow{\text{LiAlH}_4} \text{CH}_3\text{CH}_2\text{OH}(\text{Y})$

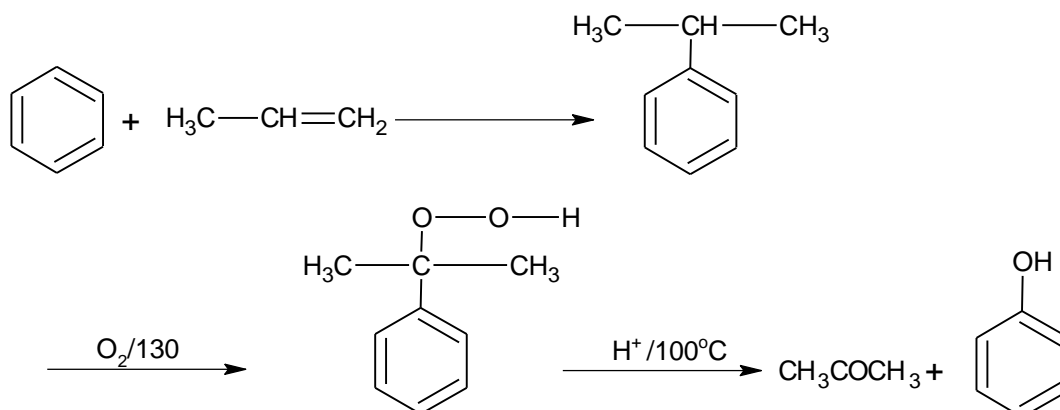
$\text{CH}_3\text{CH}_2\text{OH} \xrightarrow{\text{Cu}} \text{CH}_3\text{CHO}(\text{X})$

25. Ans: (b)

Intermediate which is formed during 1,2 methyl shift is 3° carbonium ion.

26. Ans: (a)

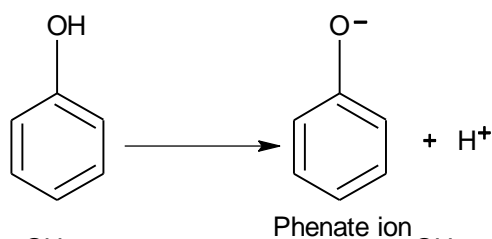
The bond between O and sp^2 hybrid C is strong due to resonance.



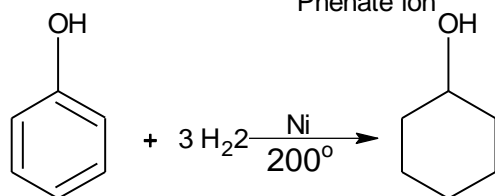
27. Ans: (a)

28. Ans: (c)

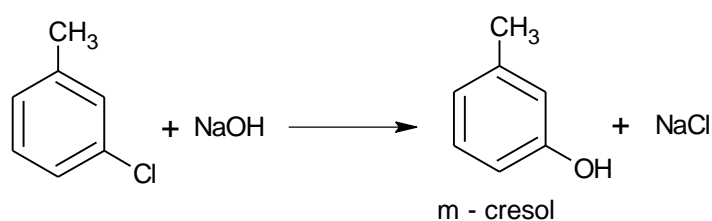
The phenate ion is resonance stabilized. Hence ionization takes place making phenol acidic.



29. Ans: (b)



30. Ans: (a)



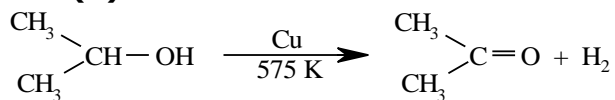
31:Ans:(b)

The reactivity of alcohols towards halogen acids decreases in the order: $3^{\circ} > 2^{\circ} > 1^{\circ}$

32.Ans:(d)

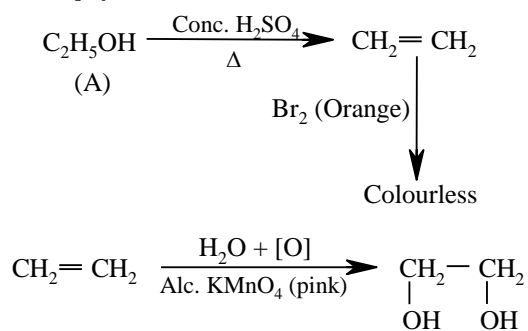
3° alcohols being most reactive, react with conc. HCl at room temperature.

33.Ans (d)

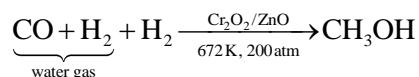


Since H_2 is removed it is called dehydrogenation

34.Ans (c)



35.Ans (c)



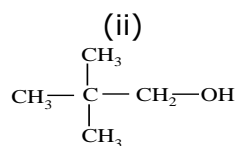
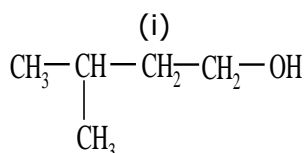
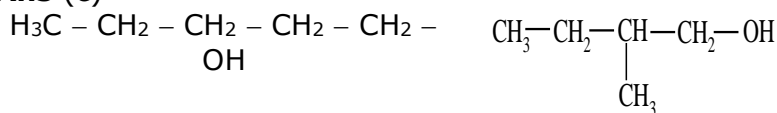
36.Ans (d)

37.Ans (d)

38.Ans (d)

$\text{R}-\text{O}-\text{H} + \text{NaNH}_2 \rightarrow \text{RONa} + \text{NH}_3$ Thus in this reaction the O-H bond is cleaved

39.Ans (c)



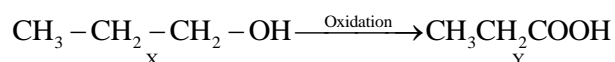
(iii)

(iv)

40.Ans (a)

Zymase

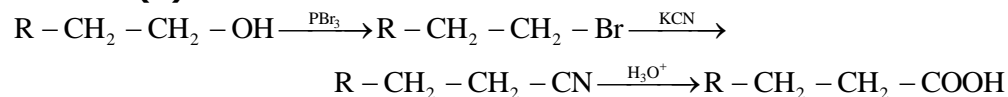
41.Ans (a)



42.Ans (d)

benzene is formed

43. Ans (a)



44.Ans (a)

The reaction of phenols with benzoyl chloride in the presence of aq. NaOH is known as Schotten Baumann reaction

45:Ans (a)

Electron withdrawing groups will increase the acidic character while electron releasing group will decrease the acidic character. Further R-effect is stronger than I-effect
Here, -Cl has -I effect and +R effect

-CH₃ has weak +I effect

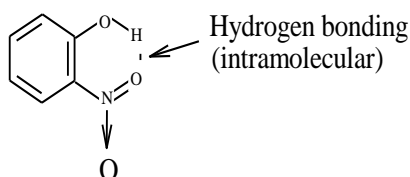
-NO₂ has -I and -R effect and

-OCH₃ has -I and +R effect

Thus correct order is III > I > II > IV

46:Ans (b)

The solubility of ortho-nitrophenol is less in water due to intramolecular H-bonding

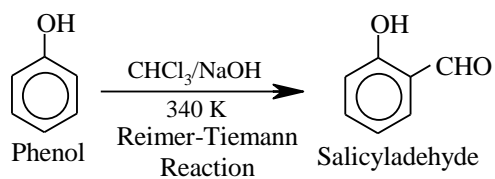


47:Ans (d)

$\text{CH}_2 = \text{CH} - \text{CH}_2 - \text{Cl}$ (Allylic and 1°) > $\text{CH}_3\text{CH}_2\text{CH}_2 - \text{Br}$ (1° and C - Br bond) >

$\text{CH}_3\text{CH}_2\text{CH}_2 - \text{Cl}$ (1° and C - Cl bond) > $(\text{CH}_3)_3\text{CCH}_2$ (Neopentyl bromide, a sterically hindered R - X)

48:Ans (b)



49:Ans (b)

1,2 dihydroxy benzene- resorcinol

50:Ans (b)

Esters react with Grignard reagent to form tert-alcohols having at least two alkyl groups, introduced through Grignard reagent, identical, the third introduced ester may be similar or different.

