



## CHEMISTRY

### BOOKS - V PUBLICATION

### ALCOHOLS, PHENOLS AND ETHERS

#### Question Bank

1. Classify the following as primary, secondary and tertiary alcohols:

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2. Identify allylic alcohols in the given examples

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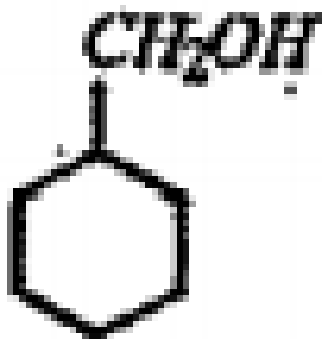
3. Name the following compounds according to IUPAC system of nomenclature:
- i.  $CH_3CH(CH_3)CH_2CH_2CHO$       ii.  $CH_3CH_2COCH(C_2H_5)CH_2CH_2Cl$
- iii.  $CH_3CH = CHCHO$       iv.  $CH_3COCH_2COCH_3$
- v.  $CH_3CH(CH_3)CH_2C(CH_3)_2COCH_3$       vi.  $(CH_3)_3CCH_2COOH$
- vii:  $OHCC_6H_4CHO - p$



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4. Show how the following alcohols are prepared by the reaction of a suitable Grignard reagent on methanal.

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5. Give the structures of the products you would expect when each of the following alcohol reacts with

HBr a. butan-1-ol b. 2-methylbutan-2-ol

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6. Predict the major products of acid catalysed dehydration of

1-Methylcyclohexanol

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7. Ortho and para nitrophenols are more acidic than phenol. Draw the resonance structures of the corresponding phenoxide ions

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8. Write the equation involved in the following reactions

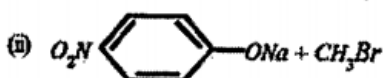
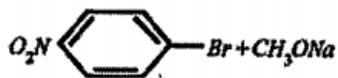
Reimer-Tiemann reaction

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9. Write the reaction of Williamson's synthesis of 2-ethoxy-3-methylpentane starting from ethanol and 3-methylpentan-2-ol

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10. Which of the following is an appropriate set of reactants for the preparation of 1-methoxy-4-nitrobenzene? Why?



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11. Predict the products of the following reactions



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12. Write IUPAC names of the following compounds.  $(\text{CH}_3)_2\text{CHNH}_2$

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13. Write the structures of the compounds whose IUPAC names are as follows: (i) 2 - Methylbutan - 2 ol

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14. Draw the structures of all isomeric alcohols of molecular formula  $C_5H_{12}O$  and give their IUPAC names

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15. Explain why propanol has higher boiling point than that of the hydrocarbon, butane?

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16. Alcohols are comparatively more soluble in water than hydrocarbons of comparable molecular masses. Explain this fact.



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17. What is meant by hydroboration-oxidation reaction? Illustrate it with an example.



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18. Give the structures and IUPAC names of monohydric phenols of molecular formula  $C_7H_8O$



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19. While separating a mixture of ortho and para nitrophenols by steam distillation, name the isomer which will be steam volatile. Give reason.



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20. Give the equations of reactions for the preparation of phenol from cumene.

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21. Write chemical reaction for the preparation of phenol from chlorobenzene.

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22. Write the mechanism of hydration of ethene to yield ethanol.

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23. You are given benzene, conc  $H_2SO_4$  and NaOH. Write the equations for the preparation of phenol using these reagents.

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24. Show how will you synthesise (i)I-phenyl ethanol from a suitable alkene,

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25. Give two reactions that show the acidic nature of phenol. Compare acidity of phenol with that of ethanol

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26. Explain why is ortho nitrophenol more acidic than ortho methoxyphenol?

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27. Explain how does the OH group attached to a carbon of benzene ring activate it towards electrophilic substitution?

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28. Give equations of the following reactions: i) Oxidation of propan-1-ol, with alkaline  $KMnO_4$  solution. ii), Bromine in  $CS_2$  with phenol

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29. Explain the following with an example. (iii) - Williamson ether synthesis

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30. Write the mechanism of acid dehydration of ethanol to yield ethene.

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**31.** How are the following conversions carried out? i. Benzyl chloride  $\rightarrow$  Benzyl alcohol

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**32.** Name the reagents used in the following reactions: i Oxidation of a primary alcohol to carboxylic acid ii. Oxidation of a primary alcohol to aldehyde. iii. Bromination of phenol to 2,4,6- tribromophenol iv. Benzyl alcohol to benzoic acid. v. Dehydration of propan- 2 -ol to propene: vi. Butan- 2 -one to butan- 2-ol

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**33.** Methanol and ethanol are two commercially important alcohols.

The boiling point of ethanol is higher than that of methoxy methane. Give reason.

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34. Write IUPAC names of the following compounds.  $(CH_3)_2CHNH_2$

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35. Write the names of reagents and equations for the preparation of the following ethers by Williamson synthesis: i. 1-Propoxypropane : ii. Ethoxybenzene iii. 2-Methoxy-2-methylpropane iv. 1-Methoxyethane

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36. Illustrate with example the limitations of Williamson synthesis for the preparation of certain types of ethers

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37. How is 1-propoxypropane synthesised from propan-1-ol? Write mechanism of this reaction

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38. Preparation of ethers by acid dehydration of secondary or tertiary alcohols is not a suitable method. Give reason.

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39. Write the equation of the reaction of hydrogen iodide with: i. 1-propoxypropane

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40. Explain the fact that in aryl alkyl ethers (i) the alkoxy group activates the benzene ring towards electrophilic substitution and (ii) it directs the

incoming substituents to ortho and para positions in benzene ring.

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**41.** Write the mechanism of the reaction of HI with methoxymethane

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**42.** Write, equations of the following reactions: ii) Nitration of anisole.

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**43.** When 3-methylbutan-2-ol is treated with HBr, the following reaction takes place: Give a mechanism for this reaction. (Hint: The secondary carbocation formed in step I, then rearranges to a more stable- tertiary carbocation by a hydride ion shift from 3rd carbon atom.)

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44. One student argues that he can prepare propan-2-ol from acetaldehyde and methyl magnesium bromide. i. Write the chemical equation for this preparation. ii. You are given methylmagnesium bromide. Select a carbonyl compound from the list given below to prepare ethanol. a. methanal b. ethanal c. propanone ii. Mention the visible change and its chemistry when 2-methyl-2-propanol is treated with Lucas reagent.

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45. Based on the action of alcohols and phenols towards (i) Litmus paper (ii)  $FeCl_3$  solution and (iii) NaOH solution, draw a chart showing 'Distinction between alcohols and phenols.'

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46. Your teacher gives you two bottles, one with ethanol and the other with methanol without labelling. i. Write a suitable test to distinguish

them. ii. By using the same test, can you distinguish between propan-1-ol and ethanol? Write the chemical equation.

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**47.** The bond angle in C-O-H, in alcohols is slightly less than tetrahedral angle. a. Give the reason for the difference in the bond angle observed in alcohol. b. What is the bond angle in C-O-H in phenol? And give the reason for the variation.

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**48.** The boiling points of ethers are much lower than that of isomeric alcohols, Do you agree? Justify

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49. Phenol is acidic but does not react with sodium bicarbonate solution.

Why?

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50. Anhydrous  $CaCl_2$ , is not recommended as a drying agent for alcohols and amines. Why?

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51. Why is phenol more acidic than ethyl alcohol?

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52. Write chemical reaction of aniline with benzoyl chloride and write the name of the product obtained.

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53. Name the major product formed when sodium phenoxide is heated with  $CO_2$  at 400. K under 4.7-*atm* pressure. Name the reaction?

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54. Arrange  $CH_3OH$ ,  $H_2O$ ,  $C_6H_5OH$  in order of decreasing acid strength?

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55. Among ROH and R'OH, ROH is basic and R'OH is acidic. How is R different from R' ?

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56. Give the order of acidic character of  $1^\circ$ ,  $2^\circ$  and  $3^\circ$  alcohols.

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57. How will you convert ethanol to ethylene?

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58. Unlike phenol 2,4 dinitrophenol and 2,4,6 trinitro phenol are soluble in aqueous sodium carbonate solution. Why?

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59. Why  $(CH_3)_3C - OH$  is less acidic than  $(CH_3)_3SiOH$  although carbon is more electro negative than silicon?

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60. Predict the major product of the following reaction:

'(##VPU\_HSS\_CHE\_XII\_C11\_E03\_017\_Q01##)'

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61. A compound  $C_4H_{10}O$

is found  $\rightarrow$   $\leq \in$  concentrated sulphuric acid, (A) does not react

$KMnO_4$ . When (A) is heated with excess of  $H^+$ , it gives a single alkyl halide.

Deduce the structure of compound (A) and explain all the reactions involved.

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62. When tert-butanol and n-butanol are separately treated with a few drops of dilute  $KMnO_4$ . In one case, only, the purple colour disappears and a brown precipitate is formed. Which of the two alcohols gives the above reaction and what is the brown precipitate?

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63. An optically active alcohol (A)  $[C_6H_{10}O]$  absorbs two moles of hydrogen per mole of (A) upon catalytic hydrogenation and gives a product (B). The compound (B) is resistant to oxidation by  $CrO_3$  and does not show any optical activity. Deduce the structures of A and B

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64. A compound D ( $C_8H_{10}O$ ) upon treatment with alkaline solution of iodine gives a yellow precipitate. The filtrate on acidification gives a white solid (E) ( $C_7H_6O_2$ ). Write the structures of D, E and explain the formation of E ?

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65. An organic compound (A)  $C_6H_{12}O_3$  on treatment with concentrated  $H_2SO_4$  gives  $CO$ ,  $H_2O$  and (B). Compound (B) can be prepared by passing vapours of 1-pentanol over heated copper at 570 K. Compound

(A) on heating gives (C),  $C_{12}H_{20}O_4$ . Give the structures of (A) to (C) with proper reasoning.

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66. An organic compound A on treatment with  $CHCl_3$  and KOH gives two compounds B and C. Both B and C give the same product (D) when distilled with zinc dust. Oxidation of D gives E, having molecular formula  $C_7H_6O_2$ . The sodium salt of E on heating with soda lime gives F which may also be obtained by distilling A with zinc dust. Identify A to F,

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67. How will you bring about the following conversions? (i) Phenol to O-bromophenol

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68. An organic compound A,  $C_8H_6$  on treatment with dilute sulphuric acid-containing mercuric sulphate gives a compound B, which can also be obtained from a reaction of benzene with an acid chloride in the presence of anhydrous aluminium chloride. The compound B, when treated with Iodine in aqueous KOH, yields C and a yellow compound D. Identify A B C and D with justification.

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69. A compound A with molecular formula  $C_4H_{10}O$ . on oxidation forms compound B. The compound B gives positive iodoform test. Compound B on reaction with  $CH_3MgBr$  followed by hydrolysis gives: C. Identify A, B and C and give the sequence of reactions.

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70. Dehydration of FIGURE give a compound which exists in two isomeric forms. Give the structure of both the isomers?



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71. An organic compound A gives positive Liebermann reaction and on treatment with  $\text{CHCl}_3/\text{KOH}$  followed by hydrolysis gives (B) and (C). Compound (B) gives colour with Schiff's reagent but not (C), which is steam volatile. (C) on treatment with  $\text{LiAlH}_4$  gives D,  $\text{C}_7\text{H}_8\text{O}_2$  which on oxidation gives E. Compound E reacts with  $(\text{CH}_3\text{CO})_2\text{O}/\text{CH}_3\text{COOH}$  to give a pain reliever F. Give structures of A to F with proper reasoning?



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72. Two different Grignard reagents x and y produce  $\text{C}_6\text{H}_5\text{CH}_2\text{C}(\text{CH}_3)_2\text{OH}$  on reaction with P and Q respectively. Give structures of X, Y, P, Q.



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73. How would you prepare 4 - methoxy phenol from bromobenzene in not more than 5 steps? State clearly the reagents used in each step and show the structures of the intermediate, compounds in your synthetic scheme?

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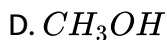
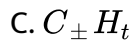
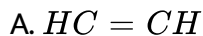
74. Which of the following will not be soluble in sodium bicarbonate?

- A. 2,4,6-trinitrophenol
- B. Benzoic acid
- C. O- nitrophenol
- D. Benzene sulphonic acid

**Answer: C**

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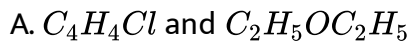
75. Among the following compounds, strongest acid is? :  $HC \equiv CH$ ,  
 $C_6H_6$ ,  $C_2H_6$ ,  $CH_3OH$



**Answer: D**

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76. Ethanol when reacted with  $PCl_5$  gives A,  $POCl_3$  and HCl. A reacts with  $AgNO_2$  to form B as major product and  $AgCl$ . A and B respectively are?



C.  $C_2H_5Cl$  and  $C_2H_3NO_2$

D.  $C_2H_6$  and  $C_2H_6NO_2$

**Answer: C**

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77. Absolute Alcohol is prepared by : Vacuum distillation, Azeotropic distillation, Steam distillation, none of these

A. Vacuum distillation

B. Azeotropic distillation

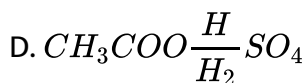
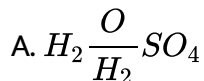
C. Steam distillation

D. none of these

**Answer: B**

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78. Propan-1-ol can be prepared from propene by :  $(H_2O) / (H_2SO_4)$  ,  
 $(Hg(OAc)_2) / (H_2O)$  followed by  $NaBH_4$ ,  $B_2H_6$  followed by  $H_2O_2$ ,  
 $(CH_3COOH) / (H_2SO_4)$



Answer: C



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79. When phenyl magnesium bromide reacts with tertiary butanol, which of the following is formed?

A. tert-butyl methyl ether

B. benzene

C. t-butyl benzene

D. phenol

**Answer: B**



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**80.** Which of the following components will give a secondary alcohol on reaction with grignard reagent followed by acid hydrolysis? I.  $HCHO$  II.  $C_2H_5CHO$  III.  $CH_3COCH_3$  IV  $HCOOC_2H_5$  select the correct answer using the codes given below. : ii only, III only, II and IV, II and III, I and IV

A. ii only

B. III only

C. I and IV

D. II

III

**Answer:**

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81. n- Propyl alcohol and isopropyl alcohol can be chemically distinguished by which reagent

A.  $PCl_5$

B. Reduction

C. oxidation with potassium dichromate

D. ozonolysis

**Answer: C**

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82. Wood spirit is

A. methanol

B. ethanol

C. acetone

D. benzene

**Answer: A**

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**83.** The most suitable reagent for the conversion of primary alcohol into aldehyde with the same number of carbon atoms is

A. acidified  $K_2Cr_2O_7$

B. acidified  $KMnO_4$

C. alkaline  $KMnO_4$

D. pyridinium chlorochromate

**Answer: D**

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84. In  $\text{CH}_3\text{CH}_2\text{OH}$ , the bond that undergoes heterolytic change most readily is

- A. C-C
- B. C - O
- C. C - H
- D. O-H

**Answer: D**

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85. Which of the following enzymes converts glucose into ethyl alcohol?

- A. diastase
- B. invertase



C. maltase

D. zymase

**Answer: D**

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**86.** Which of the following is the most suitable method for removing the traces of water from ethanol?

A. heating with Na metal

B. Passing dry HCl gas through it

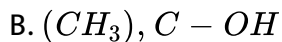
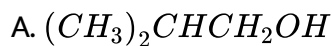
C. Distilling it

D. Reacting with Mg

**Answer: D**

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87. The compound which gives the most stable carbonium ion on dehydration is:



Answer: B



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88. Aspirin is an acetylation product of

A. p-dihydroxybenzene

B. o-hydroxybenzene

C. o-dihydroxybenzene

D. o-hydroxybenzoic acid

**Answer: B**

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**89.** Increasing order of acid strength among p-methoxy phenol, p-methylphenol and p-nitrophenol is as

- A. p-nitro phenol p-methoxy phenol. p-methyl phenol
- B. p-methyl phenol, p-methoxy phenol, p-nitro phenol
- C. p-nitro phenol. p-methyl phenol. *p*-methoxy phenol
- D. p-methoxy phenol, p-methyl phenol. p- nitro phenol

**Answer: D**

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**90.** The reaction of FIGURE with RMgX leads to the formation of

A. RCHOHR

B. RCHOH CH<sub>3</sub>

C. R<sub>2</sub>CHCH<sub>2</sub>OH

D. RCH<sub>2</sub>CH<sub>2</sub>OH

**Answer: D**

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91. n- Propyl alcohol and isopropyl alcohol can be chemically distinguished by which reagent

A. oxidation with  $KMnO_4$  followed by reaction with Fehling solution.

B. Oxidation with acidic dichromate followed by reaction with Fehling solution

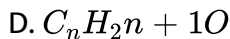
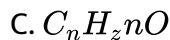
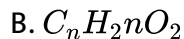
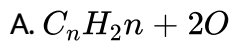
C. Oxidation, by heating with copper followed by reaction. with Fehling solution

D. Oxidation with concentrated  $H_2SO_4$  followed by reaction with Fehling solution

**Answer: C**

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92. The general molecular-formula' which represents the homologous series of alkanols is :  $C_nH_{2n+2}O, C_nH_{2n}O_2, C_nH_{2n}O, C_nH_{2n+1}O$



**Answer: A**

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93. When 3,3 -dimethyl -2' -butanol is heated with ' $H_2SO_4$ ', the major product is 3,3 -dimethyl-1-butene 2,3 -dimethyl-2-butene 2,3 -dimethyl-1-butene

A. 2,3 - dimethyl -2 -butene

B. 2,3 - dimethyl - 1 -butene

C. 3,3, - dimethyl - 1 - butene

D. cis and trans - isomers of 2,3 dimethyl -1-butene

**Answer: A**



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94. An organic compound A reacts with  $CH_3MgI$  to form an addition product which on hydrolysis forms the compound B. Compound B gives blue coloured salt in Victor Meyer's test. The compounds A and B respectively are : Acetaldehyde, tertiary butyl alcohol, Acetaldehyde, ethyl alcohol, Acetaldehyde, isopropyl alcohol, Acetone, isopropyl alcohol

A. Acetaldehyde, tertiary butyl alcohol

B. Acetaldehyde, ethyl alcohol

C. Acetaldehyde, isopropyl alcohol

D. Acetone, isopropyl alcohol

**Answer: C**

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95. In the Victor - Meyer's test, the colour given by  $1^\circ$ ,  $2^\circ$  and  $3^\circ$  alcohols are respectively. : red, colourless, blue, red, blue, colourless, colourless, red, blue, blue, red, violet

A. red, colourless, blue

B. red, blue, colourless

C. colourless, red, blue

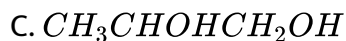
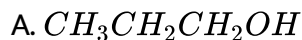
D. blue, red, violet

**Answer: B**



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**96.** In the hydroboration-oxidation reaction of propene produces



**Answer: A**



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**97.** Hydroboration -oxidation of 4 -methyloctene would give





B. 2-methyldecane

C. 4-methylheptanol

D. 4-methyl-2-octanone

**Answer: A**

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**98.** which one of the following compounds will be most readily attacked by an electrophile? Chlorobenzene, Benzene, Phenol, Toluene

A. Chlorobenzene

B. Benzene

C. Phenol

D. Toluene

**Answer: C**

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99. An organic compound X on treatment with acidified  $K_2Cr_2O_7$  gives a compound Y which reacts with  $I_2$  and sodium carbonate to form triiodomethane the compound X is :  $CH_3OH$ ,  $CH_3COCH_3$ ,  $CH_3CHOHCH_3$ ,  $CH_3CH_2CHO$

A.  $CH_3OH$

B.  $CH_3COCH_3$

C.  $CH_3CHOHCH_2OH$

D.  $CH_3CH_2CHO$

Answer: D



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100. The most suitable method of separation of a mixture of ortho and para nitrophenols mixed in the ratio of 1:1 is

- A. Steam distillation
- B. Crystallisation
- C. Vapourisation
- D. Colour spectrum

**Answer: A**

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**101.** During dehydration of alcohols to alkenes by heating with conc.  $\text{H}_2\text{SO}_4$ . The initial step is

- A. Formation of an ester
- B. Protonation of alcohol molecule
- C. Formation of carbocation
- D. Elimination of water

**Answer: B**

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**102.** The product formed on reaction of n-butanol with  $SOCl_2$  in presence of pyridine is : chlorobutanol, 1-chlorobutane, chlorobutanone, 2-chlorobutane

- A. chlorobutanol
- B. 1-chlorobutane
- C. chlorobutanone
- D. 2-chlorobutane

**Answer: B**

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**103.** Predict the product:

'(##VPU\_HSS\_CHE\_XII\_C11\_E04\_030\_Q01##)'

A. F

B. F

C. F

D. F

**Answer: C**



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