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Time : 6 hr

Total Marks = 150

Date: 25/10/2017

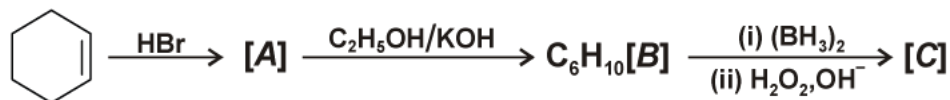
- Q1. What is the mechanism of Reimer Tiemann reaction? 3**
- Q2. Arrange the following compounds in the decreasing order of their boiling points and solubility in H<sub>2</sub>O. 3**
- a. (I) Methanol (II) Ethanol (III) Propan-1-ol (IV) Butan-1-ol  
(V) Butan-2-ol (VI) Pentan-1-ol
- b. (I) Pentanol (II) *n*-Butane (III) Pentanal (IV) Ethoxy ethane
- c. (I) Pentane (II) Pentane-1,2,3-triol (III) Butanol
- Q3. How are the following conversions carried out? 3**
- (a) Propene  $\longrightarrow$  Propan-2-ol  
(b) Benzyl chloride  $\longrightarrow$  Benzyl alcohol  
(c) Ethyl magnesium chloride  $\longrightarrow$  Propan-1-ol  
(d) Methyl magnesium bromide  $\longrightarrow$  2-methylpropan-2-ol.
- Q4. Give the equations of the following reactions: 3**
- (a) Oxidation of propan-1-ol with alkaline KMnO<sub>4</sub> solution.  
(b) Bromine in CS<sub>2</sub> with phenol.  
(c) Dilute HNO<sub>3</sub> with phenol.  
(d) Treating phenol with chloroform in presence of aqueous NaOH at 343 K.
- Q5. Write short notes on: 3**
- (a) Kolbe reaction (b) Reimer-Tiemann reaction  
(c) Williamson ether synthesis (d) Unsymmetrical ether
- Q6. How will you convert 3**
- (a) Acetaldehyde to formaldehyde? (b) Acetic acid to acetylene?
- Q7. What is the mechanism of acid catalysed dehydration of alcohols? What is the order of reactivity of different types of alcohols towards this reaction? 3**
- Q8. How will you convert 3**
- (a) Benzene to *m*-nitrobenzoic acid (b) Benzene to phenylethanoic acid
- Q9. How will you convert 3**
- (a) Methylchloride to acetone (b) Acetaldehyde to Pent-1, 3-diene
- Q10. Cyclobutylbromide on treatment with magnesium in dry ether forms an organometallic 3**  
(A). The organometallic compound reacts with ethanal to give an alcohol (B) after mild acidification. Prolonged treatment of alcohol (B) with an equivalent amount of HBr gives 1-bromo-1- methylcyclopentane (C). Write the structures of (A), (B) and explain how (C) is obtained from B.

Q11. 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 sequence of reactions. 3

Q12. How is 1-propoxypropane synthesised from propan-1-ol? Write mechanism of this reaction? 3

Q13. What is iodoform test? What are reactions involved in this test? 3

Q14. What are [A] to [C] in the scheme of reactions given below? 3



Q15. Write equations for the following reactions: 3

- Nitration of anisole.
- Bromination of anisole in ethanoic acid medium.
- Friedel Craft's acetylation of anisole.

Q16. How are the following conversions carried out? 3

- Propane  $\longrightarrow$  Propan-2-ol
- Ethyl magnesium chloride  $\longrightarrow$  Propan-1-ol
- Methyl magnesium bromide  $\longrightarrow$  2 Methylpropan-2-ol

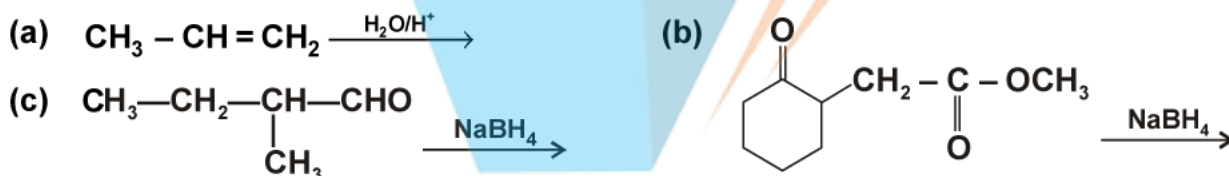
Q17. How will you convert 3

- Acetylene to *n*-butylalcohol?
- Propene to Allyl alcohol?

Q18. Show how will you synthesize 3

- 1-phenylethanol from a suitable alkene?
- Cyclohexyl nitrite from cyclohexyl chloride?
- pentan-1-ol using a suitable alkyl halide?

Q19. Write structures of the products of the following reactions: 3



Q20. How will you distinguish between 1-phenylethanol and 2-phenylethanol? 3

Q21. Write the equation of the reaction of hydrogen iodide with 3

- 1-Propoxypropane
- Methoxybenzene, and
- Benzyl ethyl ether.

Q22. Arrange the following compounds in the decreasing order of their boiling points and solubility in  $H_2O$ . 3

- (I) Butane (II) Butanol (III) Pentanol
- (I) Pentan-1-ol (II) 2-Methyl butan-2-ol (III) 3-Methyl butan-2-ol
- (I) *n*-Butyl alcohol (II) *sec*-Butyl alcohol (III) *t*-Butyl alcohol

Q23. How will you convert 3

- Benzoic acid to *p*-nitro benzoic acid
- Propanoic acid to propenoic acid

Q24. What is the order of reactivity of various types of alcohols in the reactions involving cleavage of carbon-oxygen bond? Explain. 3

Q25. Give possible explanation for each of the following: 3

- (a) Cyclohexanone forms cyanohydrin in good yield but 2,2,6-trimethylcyclohexanone does not.  
(b) There are two  $\text{—NH}_2$  groups in semicarbazide. However, only one is involved in the formation of semicarbazones.  
(c) During the preparation of esters from a carboxylic acid and an alcohol in the presence of an acid catalyst, the water or the ester should be removed as fast as it is formed.

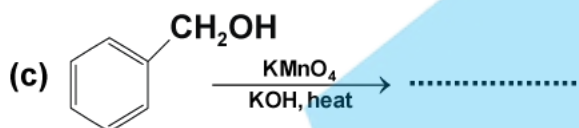
Q26. How would you account for the following? 3

- (a) Aldehyde are more reactive than ketones towards nucleophiles.  
(b) The boiling points of aldehydes and ketones are lower than of the corresponding acids.  
(c) The aldehydes and ketones undergo a number of addition reactions.

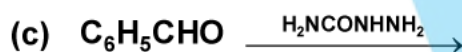
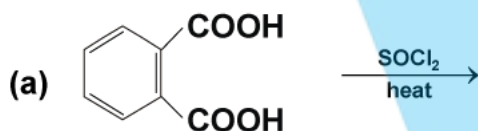
Q27. Give an example of each with necessary reaction conditions: 3

- (a) Tollens' test      (b) Aldol condensation      (c) Hell Volhard Zelinsky reaction

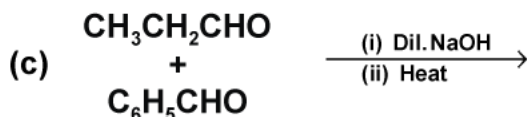
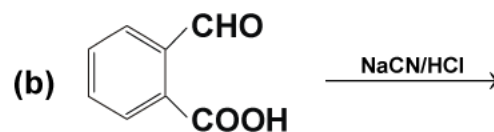
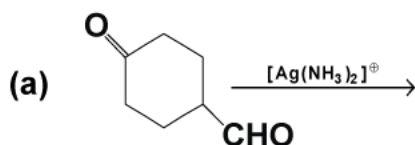
Q28. Complete the following reaction statements by giving the missing starting material, reagent or product as required. 3



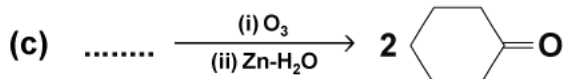
Q29. Complete each synthesis by giving missing starting material, reagent of given below products: 3



Q30. Complete each synthesis by giving missing starting material, reagent of given below products: 3



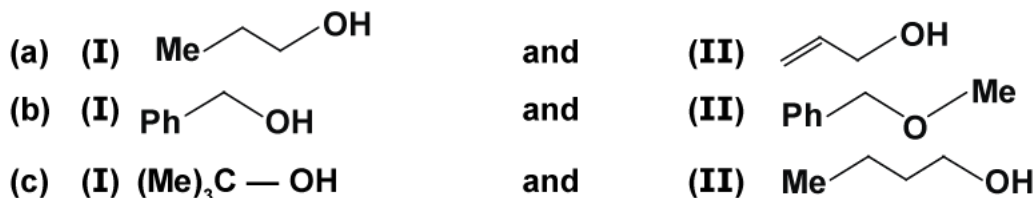
Q31. Complete each synthesis by giving missing starting material, reagent of given below products: 3



**Q32.** An organic compound (A) with molecular formula  $C_8H_8O$  forms an orange red precipitate with 2, 4-DNP reagent and gives yellow precipitate on heating with iodine in the presence of sodium hydroxide. It neither reduces Tollen's reagent or Fehling solution, nor does it decolourise bromine water or Baeyer's reagent. On drastic oxidation with chromic acid, it gives a carboxylic acid (B) having molecular formula  $C_7H_6O_2$ . Identify the compound (A) and (B) and explain the reactions involved. 3

**Q33.** Write mechanism of the reaction of HI with methoxymethane. 3

**Q34.** Distinguish between the given below pairs: 3



**Q35.** How will you obtain 3

- phenol to benzoquinone?
- methyl magnesium bromide to 2-methylpropan-2-ol?
- propene to propan-2-ol.

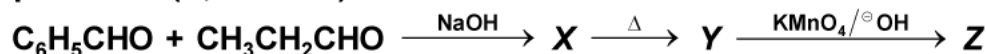
**Q36.** Give the product of the following reaction. 5



- $>C=C<$  and  $>C=O$  different type addition reaction. Explain.
- There are two  $-NH_2$  groups in semicarbazide ( $NH_2CONHNH_2$ ) but only one is involved in formation of semicarbazone. Explain.
- Arrange  $CH_3CHO, HCHO, CHO(C_6H_4)NO_2, CHO(C_6H_5)$  to nucleophilic addition reaction.

**Q37. (a)** An organic compound (A) has characteristic odour. On treatment with NaOH it forms two compounds (B) and (C). Compound (B) has molecular formula  $C_7H_8O$  which on oxidation gives back (A). The compound (C) is a sodium salt of an acid. When (C) is treated with soda lime it yields an aromatic hydrocarbon (D). Deduce the structures of (A), (B), (C) and (D). Write the sequence of reactions involved. 5

(b) Complete each synthesis by filling the missing starting materials, reagents or products. (X, Y and Z).



(c) How will you bring about the following conversions in not more than two steps?

- Toluene to benzaldehyde
- Ethylcyanide to 1-phenylpropanone.

**Q38.** An unknown aldehyde 'A' on reacting with alkali gives a  $\beta$ -hydroxy-aldehyde, which loses water to form an unsaturated aldehyde, 2-butenal. Another aldehyde 'B' undergoes disproportionation reaction in the presence of conc. alkali to form products C and D. C is an aryl alcohol with the formula  $C_7H_8O$ . 5

- Identify A and B.
- Write the sequence of reactions involved.
- Name the product, when 'B' reacts with zinc amalgam and hydrochloric acid.

Q39. Name the reagents used in the following reactions: 5

- (a) Oxidation of a primary alcohol to aldehyde.
- (b) Bromination of phenol to 2, 4, 6-tribromophenol.
- (c) Benzyl alcohol to benzoic acid.
- (d) Dehydration of propan-2-ol to propene
- (e) Butan-2-one to butan-2-ol.

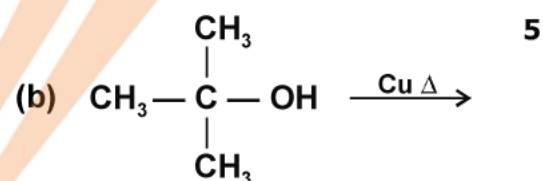
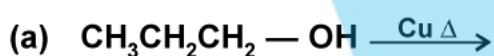
Q40. (a) An organic compound (A) has molecular formula (C<sub>5</sub>H<sub>10</sub>O). It does not reduce Tollen's reagent but forms an orange precipitate with 2, 4-DNP reagent. Give yellow precipitate on treatment with NaOH and I<sub>2</sub>. Under vigorous conditions on oxidation it gives carboxylic acid (B) and ethanoic acid. Sodium salt of (B) gave a hydrocarbon (C) in Kolbe's electrolytic reduction. Identify (A), (B) and (C) and write the reactions involved. 5

- (b) Predict the products forms in the following cases:
  - (i) (A) reacts with PhMgBr and is then hydrolysed.
  - (ii) (A) reacts with hydrazine and is then heated with KOH and ethylene glycol.

Q41. A compound 'X' (C<sub>2</sub>H<sub>4</sub>O) on oxidation gives 'Y' (C<sub>2</sub>H<sub>4</sub>O<sub>2</sub>). 'X' undergoes haloform reaction. On treatment with HCN 'X' forms a product 'Z' which on hydrolysis gives 2-hydroxy propanoic acid. 5

- (a) Write down structures of 'X' and 'Y'.
- (b) Name the product when 'X' reacts with dil NaOH.
- (c) Write down the equations for the Haloform reactions.

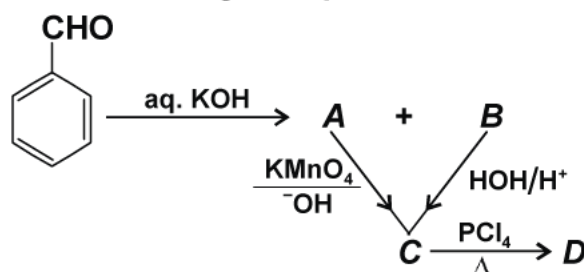
Q42. Complete the following reaction:



- (c) Pure HCN fails to react with aldehydes and ketones. Explain.
- (d) Halogen acids HX easily add to  $>\text{C}=\text{C}<$  bond but they do not add to  $>\text{C}=\text{O}$  bond. Why?
- (e) Give one test between HCOOH and CH<sub>3</sub>COOH other than Iodoform test.

Q43. (a) Write the mechanism for aldol condensation. 5

(b) Find the A, B, C, D in following set up of reaction



Q44. Identify compounds (A) – (J) in the following reactions:

5

