

Total No. of Printed Pages—19

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(November)

CHEMISTRY

(Major)

Course : 303

(Organic Chemistry—I)

*The figures in the margin indicate full marks
for the questions*

(New Course)

Full Marks : 48

Pass Marks : 14

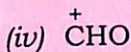
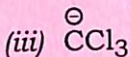
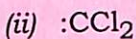
Time : 2 hours

1. Select the correct answers from the following : 1×5=5

(a) The compound formed as a result of oxidation of ethyl benzene by KMnO_4 is

- (i) benzyl alcohol
- (ii) benzophenone
- (iii) acetophenone
- (iv) benzoic acid

(b) The intermediate involved in the Reimer-Tiemann reaction is



(c) Which of the following is a Michael acceptor?

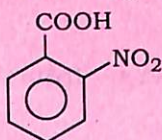
(i) Acrolein

(ii) Acetone

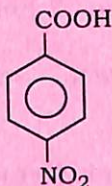
(iii) Cyclohexene

(iv) Formaldehyde

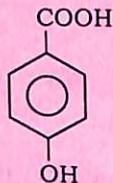
(d) The correct order of acid strength of the following acids



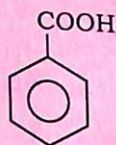
(A)



(B)



(C)



(D)

is

(i) $A < B < C < D$

(ii) $B < C < A < D$

(iii) $C < B < D < A$

(iv) $C < D < B < A$

(e) An organic compound with MF C_8H_8O forms 2,4-DNP derivative, reduces Tollen's reagent and undergoes Cannizzaro reaction. On vigorous oxidation, it gives 1,2-benzene dicarboxylic acid. The compound is

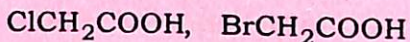
- (i) 2-ethyl benzaldehyde
- (ii) 2-methyl benzaldehyde
- (iii) 3-methyl benzaldehyde
- (iv) acetophenone

2. Answer any *four* of the following questions :

$1\frac{1}{2} \times 4 = 6$

- (a) A haloalkane reacts with KCN to form alkyl nitrile while with AgCN forms alkyl isonitrile as major product. Explain.
- (b) How will you prepare MVK from vinyl acetylene?
- (c) Define S_N1 reaction. Explain with the help of an example.
- (d) How does Lucas reagent help in the distinction of primary, secondary and tertiary alcohols? Discuss the reactions involved.

- (e) Arrange the following acids in increasing order of their acid strengths with appropriate reasoning :

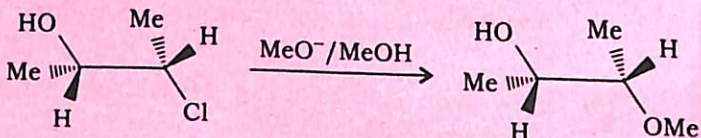


UNIT—I

Answer any *two* of the following questions : 4×2=8

3. (a) Discuss how the nature of the solvent influences the relative reactivity in nucleophilic substitution reactions. 2

- (b) Write the mechanism of the following reaction showing the participation of a neighbouring group : 2



4. (a) The rate of $\text{S}_{\text{N}}1$ reactions increases with increasing polarity of the solvents. Explain. 2

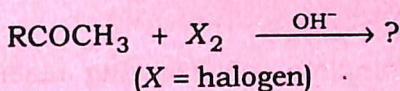
- (b) Using organometallic compound, how would you prepare 3° alcohol from ethyl acetate? 2

5. (a) Synthesize the following : 1+1=2

(i) Ethyl bromide by Hunsdiecker reaction

(ii) Fluorobenzene through diazonium salt

(b) Complete the following reaction and predict the mechanism : $\frac{1}{2} + 1\frac{1}{2} = 2$



UNIT—II

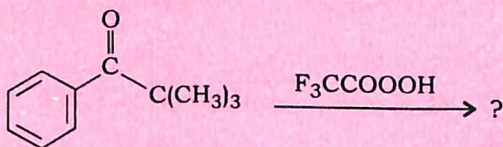
Answer any two of the following questions : 5×2=10

6. (a) Synthesize the following : 1+1=2

(i) Picric acid from phenol

(ii) *m*-nitrophenol from *m*-dinitrobenzene

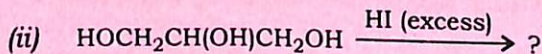
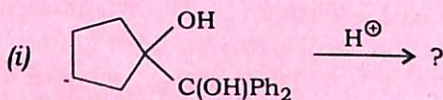
(b) Complete the following reaction and write the mechanism : 3



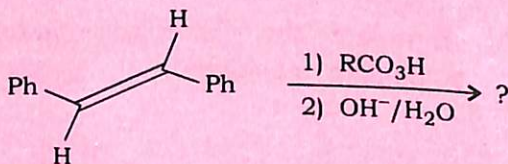
7. (a) Discuss the solubility in water and b.pt. of 1°, 2° and 3° alcohols. 3

- (b) Hydroxylation by OSO_4 of an alkene gives a *cis*-diol whereas hydroxylation via epoxidation of the same alkene gives a *trans*-diol. Explain. 2

8. (a) Complete the following reactions : 1+1=2



- (b) Predict the product and write the mechanism of the following reaction : 3

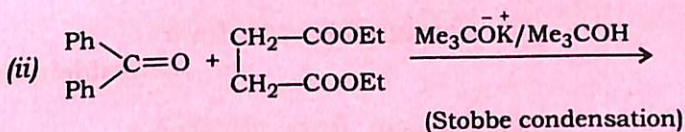
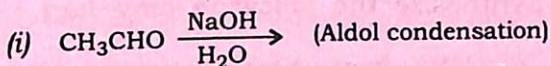


UNIT—III

Answer any one of the following questions :

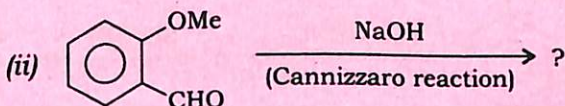
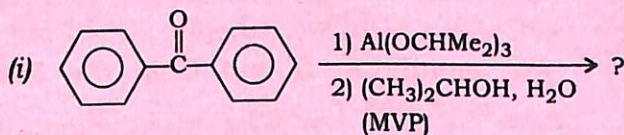
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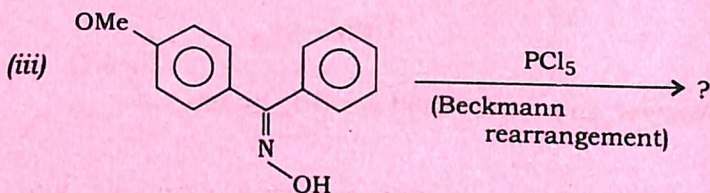
9. (a) Complete the following reactions and write down the mechanisms : $3 \times 2 = 6$



- (b) How would you distinguish between 2-pentanone and 3-pentanone? 2

10. (a) Complete the following reactions and write down the probable mechanisms (any two) : $3 \times 2 = 6$





(b) Synthesize the following (any two) : $1 \times 2 = 2$

(i) MVK from 2-butanone

(ii) Cinnamaldehyde from benzaldehyde

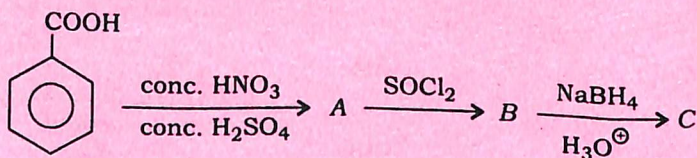
(iii) Acrolein from glycerol

UNIT—IV

Answer any one of the following questions : 9

11. (a) Why do carboxylic acids not give the characteristic reactions of carbonyl group? 2

(b) Identify A, B and C in the following reactions : 3

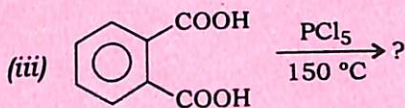
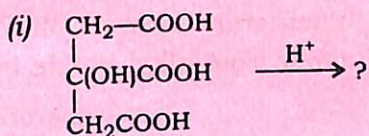


(c) Synthesize the following : 2+2=4

(i) Succinic acid from ethylene bromide

(ii) Propanoic acid to ethanoic acid by Hoffmann degradation

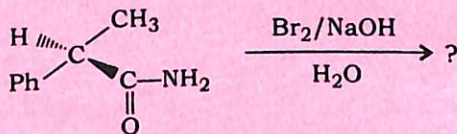
12. (a) Complete the following reactions : 1×3=3



(b) Convert benzoic acid to phenyl acetic acid by using Arndt-Eistert reaction. 2

(c) Prepare propanoic acid from butanoyl chloride by using Curtius rearrangement. 2

(d) Complete the following reaction and discuss the mechanism of the reaction : 2



UNIT—V

Answer any *one* of the following questions : 2

13. Give one method of preparation of thioether. What happens when a thiol reacts with an aldehyde in the presence of hydrochloric acid?

2

14. What are thioethers? How would you prepare a thioether from alkyl halide by S_N2 reaction?

$\frac{1}{2} + 1\frac{1}{2} = 2$

(Old Course)

Full Marks : 48

Pass Marks : 19

Time : 3 hours

1. Answer/Select the correct answers from the following : 1×5=5

(a) The appropriate reagent for the transformation



is

- (i) SeO_2
 - (ii) alk. KMnO_4
 - (iii) $\text{CrO}_3/\text{Ac}_2\text{O}$
 - (iv) $\text{Na}_2\text{Cr}_2\text{O}_7/\text{H}_2\text{SO}_4$
- (b) $\text{HO}-(\text{CH}_2)_2\text{OH}$ on heating with periodic acid gives
- (i) 2HCOOH
 - (ii) 2HCHO
 - (iii) $\text{CHO}-\text{CHO}$
 - (iv) 2CO_2

(c) The best reagent to convert pent-3-en-2-ol into pent-3-en-2-one is

- (i) acidified $K_2Cr_2O_7$
- (ii) alk. $KMnO_4$
- (iii) PCC
- (iv) chromic anhydride

(d) Which of the following compounds will give yellow ppt. with I_2 and alkali?

- (i) 2-hydroxypropane
- (ii) Methyl acetate
- (iii) Acetophenone
- (iv) Acetamide

(e) Arrange the following acids with increasing acid strength :

- (i) C_6H_5OH
- (ii) $HCOOH$
- (iii) CH_3COOH
- (iv) $ClCH_2COOH$

2. Answer any *four* of the following questions :

$1\frac{1}{2} \times 4 = 6$

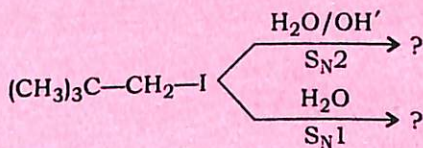
- (a) A haloalkane reacts with HNO_2 to form alkyl nitrite while AgNO_2 forms nitroalkane as the major product. Explain.
- (b) How will you convert a carboxylic acid to an acid chloride using $\text{S}_{\text{N}}1$ reaction and then to a corresponding aldehyde?
- (c) Synthesize cinnamaldehyde by using Claisen-Schmidt reaction.
- (d) How will you convert benzoyl chloride to benzaldehyde and then acetophenone?
- (e) Write the steps to carry out the conversion of phenol to salicylic acid.

UNIT—I

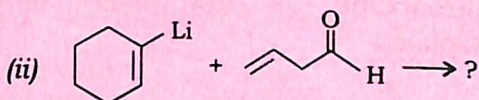
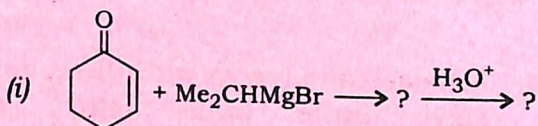
Answer any *two* of the following questions :

$4 \times 2 = 8$

3. (a) What products do you expect when neopentyl iodide undergoes slow $\text{S}_{\text{N}}1$ and $\text{S}_{\text{N}}2$ reactions respectively? 2



(b) Complete the following reactions : 2



4. (a) Comment on the following statement : 2

In all S_N2 reactions, the rate increases with increasing polarity of the solvent.

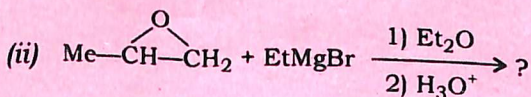
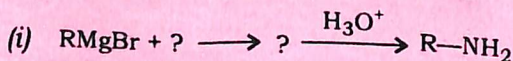
(b) Synthesize the following : 1+1=2

(i) 1-bromobutane from pentanoic acid by Hunsdiecker's reaction

(ii) Chloro- or bromobenzene from aniline by using Sandmeyer reaction

5. (a) Why are aryl halides less reactive towards nucleophilic substitution reactions than alkyl halides? 2

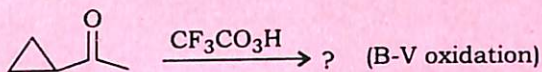
(b) Complete any one of the following reactions : 2



UNIT—II

Answer any two of the following questions : $5 \times 2 = 10$

6. (a) Complete the following reaction and discuss the mechanism involved : 3



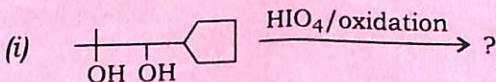
- (b) Synthesize *m*-cresol from *p*-toluidine. 2

7. (a) What is diazotization? How would you prepare bromobenzene by using Sandmeyer reaction? 2

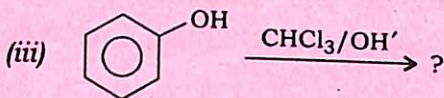
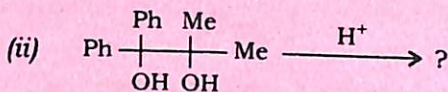
- (b) Discuss the benzyne mechanism for aromatic nucleophilic substitution reaction. Give evidence in support of the proposed mechanism. 3

8. (a) How does Victor Mayer test help in the distinction of 1°, 2° and 3° alcohols? Discuss the reactions involved. 3

- (b) Complete the following reactions (any two) : 2



(16)



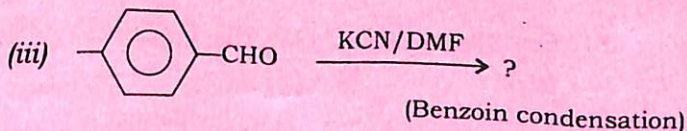
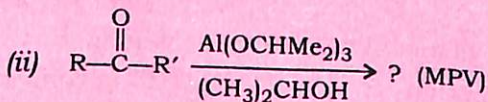
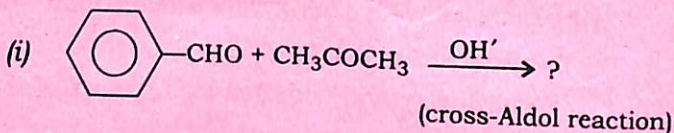
UNIT—III

Answer any one of the following questions :

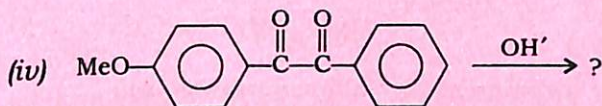
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9. Complete the following reactions with mechanisms (any four) :

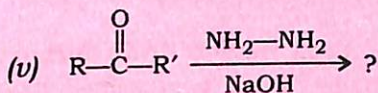
2×4=8



(17)



(Benzil-Benzilic acid rearrangement)



(Wolff-Kishner reduction)

10. (a) Prepare 2-methyl propanal from acetone by using Darzens' glycidic ester condensation. 2

(b) How would you prepare the following (any two)? 2×2=4

(i) MVK from acetone

(ii) Cinnamaldehyde by using Claisen-Schmidt condensation

(iii) Acrolein from glycerol

(c) What do you expect, benzaldehyde to be more reactive or less reactive in nucleophilic addition reaction than propanal? Explain. 2

UNIT—IV

Answer any *one* of the following questions : 9

11. (a) Discuss the mechanism of acid-catalyzed hydrolysis of ester. 3

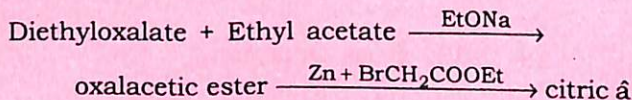
(b) Why is acetic acid weaker than fumaric acid but benzoic acid is stronger than *p*-methoxy benzoic acid? 2

(c) How would you prepare the following? $2 \times 2 = 4$

(i) Phenylacetic acid using an organo-metallic compound

(ii) Butanoic acid from propanoic acid using Arndt-Eistert synthesis

12. (a) Synthesize citric acid by using the following route : 3



(b) Synthesize the following : $2 \times 2 = 4$

(i) Pyruvic acid from tartaric acid

(ii) Cyclobutyl amine from cyclobutane carboxylic acid by using Schmidt reaction

(c) What happens when fumaric acid is subjected to hydroxylation with alk. KMnO_4 ? 2

UNIT—V

Answer any *one* of the following questions :

2

13. How would you prepare *n*-propyl mercaptan from a suitable alkyl halide by using Grignard reaction? What happens when a thiol is treated with H_2O_2 ? 1+1=2
14. How would you prepare diethyl thioether from ethyl mercaptan? What happens when a thioether is hydrolyzed with NaOH? 1+1=2
