

Total No. of Printed Pages—16

**3 SEM TDC CHM M 3 (N/O)**

**2 0 1 9**

( November )

CHEMISTRY

( Major )

Course : 303

**( Organic Chemistry—I )**

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

( New Course )

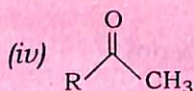
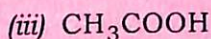
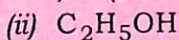
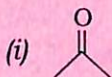
Full Marks : 48

Pass Marks : 14

Time : 2 hours

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

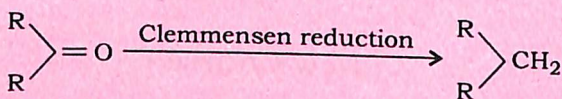
(a) Which compound does not give haloform reaction?



(b) Which of the following intermediates involves in the Reimer-Tiemann reaction?

- (i) Carbocation
- (ii) Carbanion
- (iii) Carbene
- (iv) Nitrene

(c) Pick out the correct answer for the following reduction :

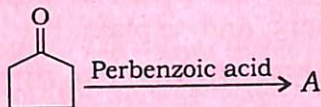


- (i)  $\text{NH}_2 - \text{NH}_2$ , NaOH
  - (ii)  $\text{LiAlH}_4$
  - (iii) Zn/Hg and HCl
  - (iv) Sn and conc. HCl
- (d) Which of the following phenols is most acidic?
- (i) *o*-nitrophenol
  - (ii) *p*-nitrophenol
  - (iii) 2, 4-dinitrophenol
  - (iv) 2, 4, 6-trinitrophenol

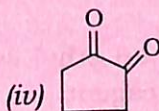
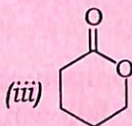
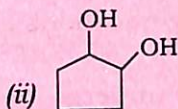


( 3 )

(e) In the reaction



the product A is



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

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

- (a) Giving a suitable example, explain the  $S_N1$  reaction.
- (b) What happens when Grignard reagent reacts with  $CO_2$ ?
- (c) Aromatic alcohols are acidic in nature but aliphatic alcohols are not. Explain.

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- (d) Arrange the following carbonyl compounds in the order of increasing dipole moment and explain :



- (e) How will you convert benzoyl chloride to benzaldehyde and then acetophenone?

UNIT—I

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

3. (a) Benzyl chloride can undergo both  $S_N1$  and  $S_N2$  reactions with high rate. Explain. 2

- (b) Using organometallic compound, how you would prepare the following (any one) : 2

(i) A  $3^\circ$  alcohol from an ethyl ester by using Grignard reagent

(ii) Methylcyclohexyl ketone by using methyl lithium

4. (a) The rate of  $S_N2$  reactions does not depend on the polarity of the solvents used in the reaction. Explain. 2

- (b) What is diazotization reaction? How would you prepare chloro- and bromobenzene by using Sandmeyer's reaction? 2

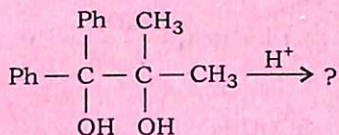


5. (a) How is benzyne intermediate generated?  
Why is it so reactive? 2
- (b) Why are aryl halides less reactive  
towards nucleophilic substitution  
reactions than alkyl halides? 2

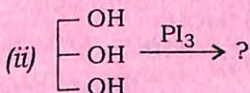
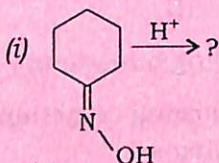
UNIT—II

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

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

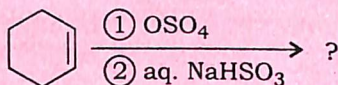


- (b) How is glycerol obtained from oils and  
fats? What happens when nitric acid is  
allowed to react with glycerol? 1+1=2
7. (a) Complete the following reactions : 1+1=2



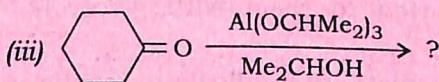
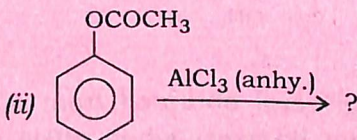
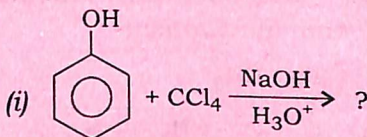
(b) Distinguish between 1°, 2° and 3° alcohols by using Victor Meyer test. 3

8. (a) Complete the following reaction : 2



(b) Complete the following reactions and write their mechanisms (any two) :

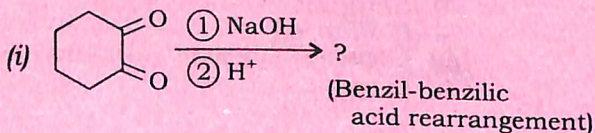
1½×2=3



### UNIT—III

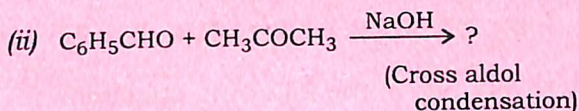
Answer any *one* of the following questions : 8

9. (a) Complete the following reactions and write the mechanisms : 3×2=6



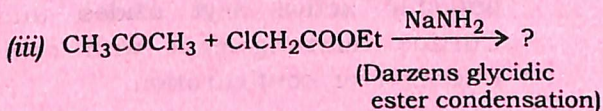
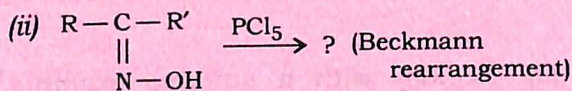


( 7 )



(b) Trichloroacetaldehyde is more reactive towards the nucleophilic addition reaction than acetaldehyde. Explain. 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 acetone

(ii) Cinnamaldehyde by using Claisen-Schmidt condensation

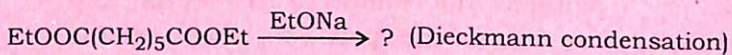
(iii) Coumarin from *o*-hydroxybenzaldehyde

## UNIT—IV

Answer any one of the following questions : 9

11. (a) Synthesize tartaric acid from acetylene.  
What happens when fumaric acid is treated with alk.  $\text{KMnO}_4$ ? 1+1=2

- (b) Complete the following reaction and discuss the mechanism involved : 3



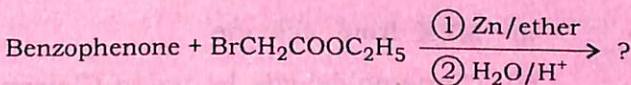
- (c) How would you prepare the following? 2+2=4

(i) Phenylacetic acid using an organometallic compound

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

12. (a) Explain with a suitable example that optically active acyl azides undergo Curtius rearrangement with complete retention of configuration. 2

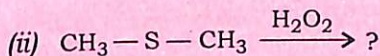
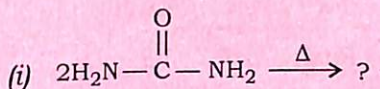
- (b) Complete the following reaction and suggest the mechanism : 3



- (c) Explain why  $\text{p}K_a$  value of chloroacetic acid is lower than  $\text{p}K_a$  value of acetic acid. 2



(d) Complete the following reactions : 1+1=2



### UNIT—V

Answer any *one* of the following questions : 2

- 13.** How would you prepare a thiol from an alkyl halide by using Grignard reaction? What happens when a thiol reacts with an aldehyde in presence of HCl? 1+1=2
- 14.** What are thioethers? How do you obtain diethyl thioether from ethyl mercaptan? 1+1=2

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( Old Course )

Full Marks : 48

Pass Marks : 19

Time : 3 hours

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

(a) Phenol is treated with chloroform in the presence of aqueous sodium hydroxide at 340 K temperature. The product is

(i) salicylaldehyde

(ii) salicylic acid

(iii) aspirin

(iv) phenolphthalein

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

(i) acidified  $K_2Cr_2O_7$

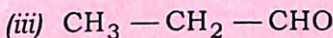
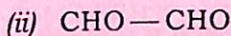
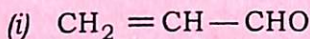
(ii) alkaline  $KMnO_4$

(iii) chromic anhydride in glacial acetic acid

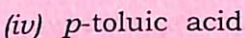
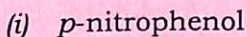
(iv) pyridinium chlorochromate



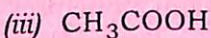
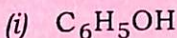
(c)  $\text{HO}-\text{CH}_2-\text{CH}(\text{OH})-\text{CH}_2-\text{OH}$  on heating with  $\text{KHSO}_4$  gives



(d) Among the following compounds which is most acidic?



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

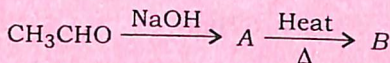


2. Answer any four of the following questions :

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

(a) Why are aryl and vinyl halides less reactive towards nucleophilic substitution?

- (b) Convert phenol to salicylaldehyde.
- (c) Identify *A* and *B* in the following reaction :



- (d) How is diethyl malonate prepared from acetic acid?
- (e) Is fumaric acid soluble in water? Synthesize fumaric acid from glyoxalic acid.

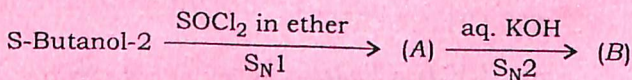
## UNIT—I

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

3. (a) Why is aryl halide less reactive towards nucleophilic substitution? 2

(b) How does aryl halide react with sodium metal? 2

4. (a) Complete the following reaction : 1



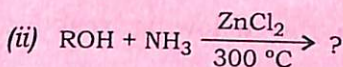
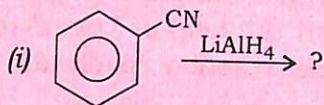
(b) Comment on the following statement : 2

In all  $\text{S}_{\text{N}}2$  reactions, the rate increases with increasing polarity of the solvent.

(c) How will you convert aniline to bromobenzene using Sandmeyer reaction? 1



5. (a) Complete the following : 2

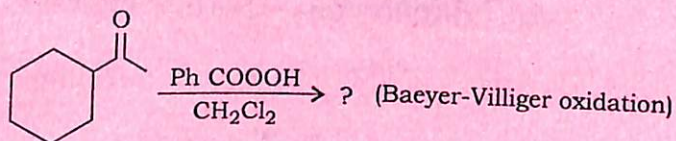


- (b) A haloalkane reacts with KCN to form alkyl nitrile while AgCN forms alkyl isonitrile as major product. Explain. 2

UNIT—II

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

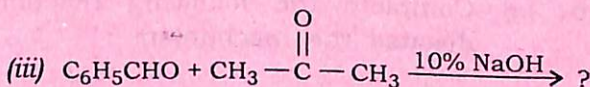
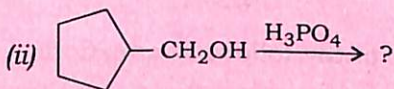
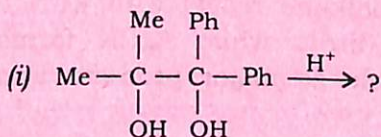
6. (a) Complete the following reaction and discuss the mechanism : 3



- (b) How would you prepare *p*-cresol from *p*-toluidine? 2
7. (a) What is diazotization reaction of amine? Why is diazotization reaction carried out at low temperature? 2+1=3
- (b) Formylation of phenol with  $\text{CHCl}_3$  and conc. NaOH gives salicylaldehyde as the major product. What is the reaction? Discuss the mechanism of the reaction. 2

8. (a) How can you distinguish 1°, 2° and 3° alcohol with the help of Lucas' reagent? Discuss the reaction involved. 3

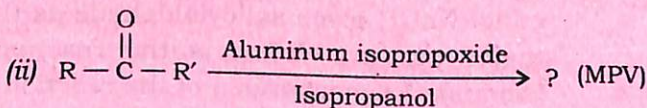
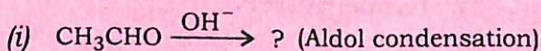
(b) Complete the following reactions (any two) : 2



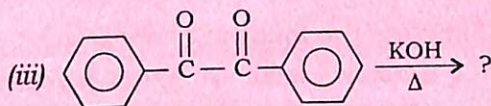
### UNIT—III

Answer any one of the following questions : 8

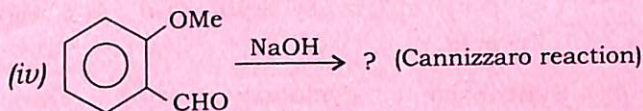
9. Complete the following reactions with mechanisms (any four) : 2×4=8



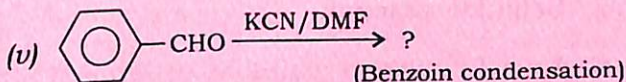




(Benzil-benzilic acid rearrangement)



(Cannizzaro reaction)



(Benzoin condensation)

10. (a) Convert the following : 2+2=4
- (i) Acetylene to acetaldehyde
- (ii) Toluene to benzaldehyde
- (b) Prepare cyclohexanal from cyclohexanone by using Darzens glycidic ester condensation. 2
- (c) How would you prepare acrolein from glycerol? 2

#### UNIT—IV

Answer any *one* of the following questions : 9

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

- (b) (i) Complete the following conversion : 2  
Benzoic acid to Phenylacetic acid by Arndt-Eistert synthesis
- (ii) Discuss and compare the acidity of *p*-nitrobenzoic acid and *p*-toluic acid. 2
- (c) Synthesize cyclobutylamine from cyclobutane carboxylic acid by using Schmidt reaction. 3
12. (a) Explain with a suitable example that optically active acyl azides undergo Curtius rearrangement with complete retention of configuration. 3
- (b) Synthesize the following : 2+2=4  
(i) Pyruvic acid from tartaric acid  
(ii) Tartaric acid from acetylene
- (c) Discuss the mechanism of acid-catalyzed hydrolysis of ester. 2

UNIT—V

Answer any *one* of the following questions : 2

13. Which is more acidic—thiol or alcohol? How would you prepare diethyl thioether from ethyl mercaptan? 1+1=2
14. Can thiols be oxidized? What happens when a thioether is hydrolyzed with NaOH? 1+1=2

★★★