

Odd Semester, 2020

(Held in March, 2021)

CHEMISTRY

(Honours)

(Chem-H-501)

(Part-B : Organic Chemistry—I)

Marks : 37

Time : 2 hours

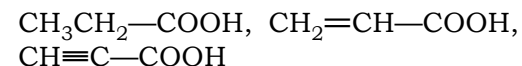
The figures in the margin indicate full marks for the questions

1. (a) *p*- and *o*-nitrophenols are much more acidic than *m*-nitrophenols. Explain. 2
- (b) The pK_b values of the amines are as follows :

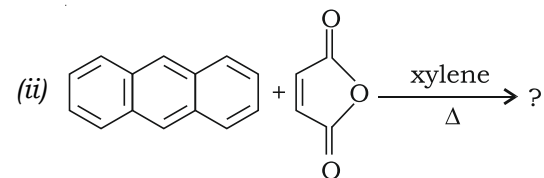
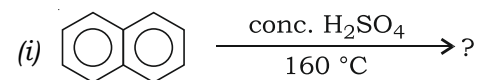
Amines	pK_b
CH_3NH_2	3.83
$(\text{CH}_3)_2\text{NH}$	3.28
$(\text{CH}_3)_3\text{N}$	4.28

Arrange the amines in order of increasing basic strength with proper justification. 1½

- (c) Compare the acidity of the following acids giving suitable explanations : 2



- (d) Give the products of the following reactions : 2



- (e) Chloroacetic acid is a stronger acid than acetic acid. Explain. 1½

OR

2. (a) Salicylic acid is a much stronger acid than *p*-hydroxy benzoic acid. Explain. 2
- (b) Giving suitable reason, arrange the following dicarboxylic acids in order of increasing acid strength : 1½
- $$\text{HOOC—COOH}, \text{HOOC—CH}_2\text{—COOH}, \text{HOOC—CH}_2\text{CH}_2\text{—COOH}$$
- (c) Explain why the $\text{C}_1\text{—C}_2$ bond length of naphthalene is 1.36 \AA while the $\text{C}_2\text{—C}_3$ bond length is 1.40 \AA . 1½

(3)

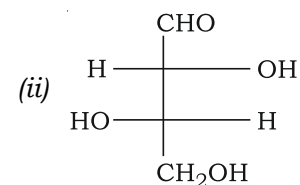
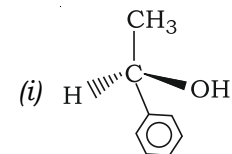
- (d) Prove that naphthalene contains two benzene rings fused together at ortho-positions. 2
- (e) Starting from naphthalene, how can you prepare 1-naphthol? Give chemical equations. 2
3. (a) Draw all the conformers of 1,2-dimethyl cyclohexane. Comment on their relative stability. 3
- (b) Explain by using chair conformation, why *t*-butyl group in *t*-butyl cyclohexane always exists in the equatorial form. 1½
- (c) What are cumulated dienes? Give two examples. 2
- (d) Write the structure of the monomers that are employed in the synthesis of terylene. 1
- (e) Write the preparation of Nylon-6 from caprolactam. 1½

OR

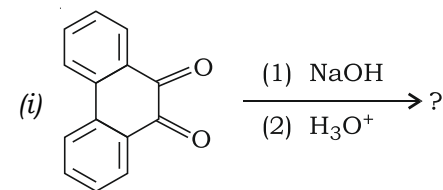
4. (a) Discuss the stereochemistry of bromine addition to *Z*-2-butene. 2

(4)

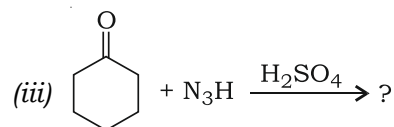
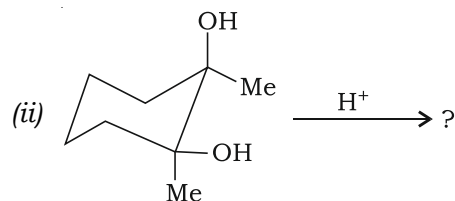
- (b) Assign *R*- and *S*-configurations to the following optical isomers : 1+1=2



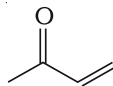
- (c) Why does HBr add to 1,3-butadiene to give both 1,2- and 1,4-addition products? 1½
- (d) Outline a mechanistic pathway for the acid catalysed cationic addition polymerization of alkylated ethylene. 2
- (e) What is natural rubber? Write the synthesis of Buna-S rubber. 1½
5. (a) Suggest an acid-catalysed mechanism for the hydrolysis of ester. 2
- (b) Write the products of the following reactions with mechanisms (any two) : 1½×2=3



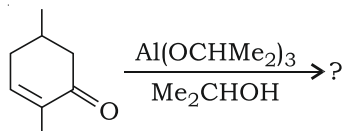
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- (c) What is a Mannich base? Synthesize the following compound by using Mannich reaction : 2

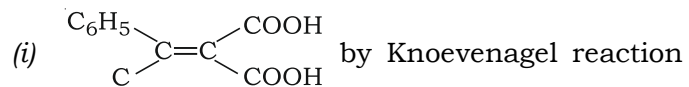


- (d) Complete the following reaction giving mechanism : 2

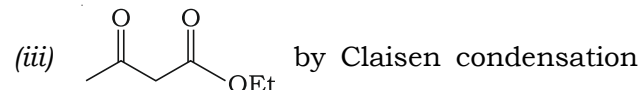
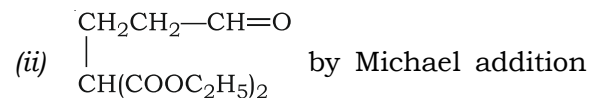


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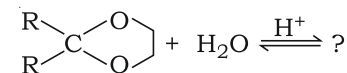
6. (a) How will you synthesize the following compounds? Write mechanisms (any two) : $1\frac{1}{2} \times 2 = 3$



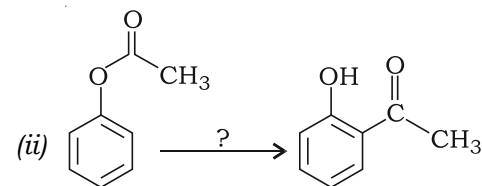
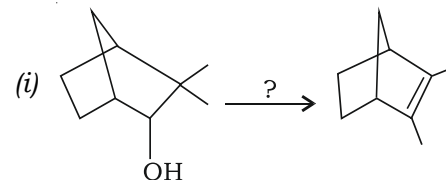
(6)



- (b) What are acetals? Write the product and mechanism of the following reaction : $1 + 1\frac{1}{2} = 2\frac{1}{2}$

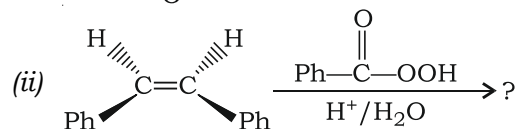
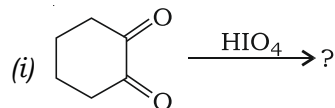


- (c) How are the following transformations carried out? Give the mechanism (any one) : $1\frac{1}{2}$



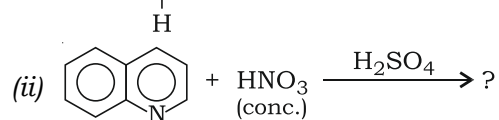
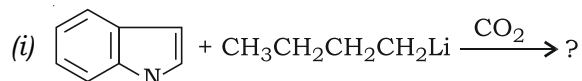
(7)

- (d) Complete the following reactions with mechanism (any one) : 2

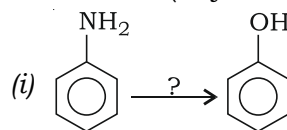


7. (a) Outline the various steps involved in the synthesis of 1-alkyl iso-quinoline by Bischler-Napieralski method. 2

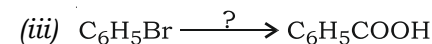
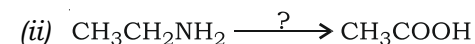
- (b) Write down the products and mechanism of the following reactions :
1½×2=3



- (c) Why are substitution reactions not atom economical? Illustrate by taking a suitable example. 1+1=2
- (d) How will you carry out the following conversions (any two)? 1½×2=3

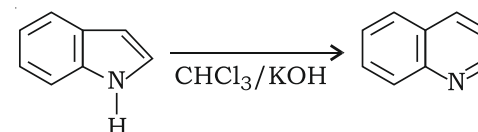


(8)



OR

8. (a) Outline the mechanism of the following conversion : 2½



- (b) What are the advantages of using ionic liquids? Give one example of a reaction carried out using ionic liquids. 2+1=3

- (c) Why quinoline does not undergo Friedel-Crafts reaction? 1½

- (d) Identify the missing products in the following reactions : 1½×2=3

