2024

CHEMISTRY

(Honours Core)

Paper : CHE–HC–4026

(Organic Chemistry–III)

Full Marks : 60

Time : Three hours

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

1. Answer the following questions : 1×7=

   (a) Write *aciform* structure of nitromethan

   (b) The aliphatic diazonium compounds a unstable, why ?

   (c) What is special isoprene rule ?

   (d) Mention *one* medicinal importance nicotine.

(e) Arrange the following compounds in increasing order of aromatic character :

Thiophene, pyrrole, benzene, furan

(f) Mention *two* adverse effects of PAN on living organisms.

(g) What class of alkaloid does nicotine belong to ?

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

(a) Write the products formed in each of the following reactions :

(i) Cyanoethane is reduced with $LiAlH_4$

(ii) Nitrobenzene is heated with a mixture of conc. HNO_3 and conc. H_2SO_4

(b) Mention *two* synthetic applications of diazonium salts with their chemical reactions.

(c) Explain why Naphthalene gives 1-Naphthalene sulphonic acid at low temperature and 2-Naphthalene sulphonic acid at high temperature.

(d) Write down the different steps involved in Bischler-Napieralski reaction leading to synthesis of isoquinoline.

(e) How can you show that

(i) α -terpineol is a 3° alcohol

(ii) geraniol has *E*-configuration

(f) What product is formed in each case when citral is allowed to react with

(i) $NaOH\ (aq)$

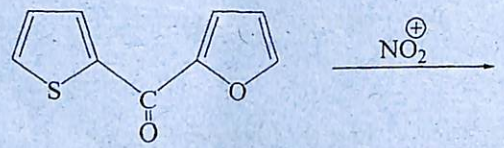
(ii) $KHSO_4$

3. Answer ***any three*** questions from the following : 5×3=15

(a) Mention *two* nitrating agents employed in direct nitration of arenes ? Explain the reaction mechanism of nitration of benzene. The 2,4,6-trinitrophenol is known as Picric acid although it does not contain a carboxyl group — why ? 2+2+1=5

(b) Explain the role of resonance effect on basic properties of aliphatic amines with special reference to isomers of nitroanilines. Explain with appropriate structures, why N,N-dimethylpicramide is more basic than picramide. 3+2=5

(c) Why does electrophilic substitution of Furan usually take place at C-2 position ? Write Paal-Knorr synthesis of Furan. Write the product(s) of the following reaction. (structure and name). 2+2+1=5



(d) Write the different products when anthracene is reacted with the following reactants : 1×5=5

(i) Sodium in THF

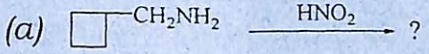
(ii) Sodium in amyl alcohol

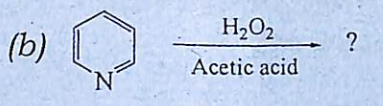
(iii) Hydrogen gas over *Ni*

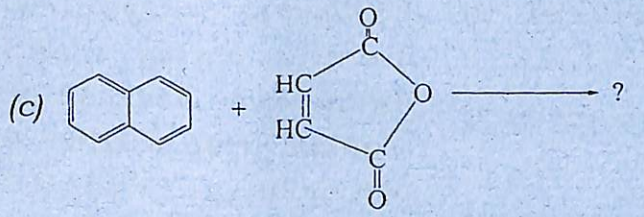
(iv) $Na_2Cr_2O_7 / H_2SO_4$

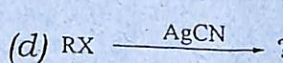
(v) HNO_3 in glacial acetic acid

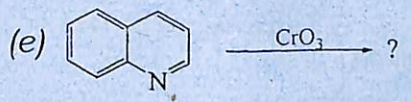
(e) Write the product of the following reactions : 1×5=5

(a) 

(b) 

(c) 

(d) 

(e) 

4. Answer ***any three*** questions from the following : 10×3=30

(a) (i) Discuss the structural difference between nitroalkanes and alkyl nitriles. Discuss how one can be distinguished from the other. Mention *two* chemical tests. 2+3=5

(ii) Elaborate the mechanism of diazotization of aniline. Mention one application of diazotization reaction. What happens when an aliphatic primary amine is diazotized ? 3+1+1=5

(b) (i) Elaborate isocyanide test for amines with appropriate mechanism. How can reaction be stopped from further release of poisonous gas ? Write the reaction. 3+1+1=5

(ii) Why do aliphatic nitro compounds dissolve in aqueous alkali ? Write the mechanism of Nef reaction. 2+3=5

(c) (i) Explain why the electrophilic substitution in naphthalene takes place mainly at the 1-position ? 2

(ii) How will you prepare 2-nitronaphthalene starting from naphthalene ? 2

(iii) Write Haworth synthesis for phenanthrene. 3

(iv) Explain the peri-hydrogen interaction in particularly in sulphonation of naphthalene. 3

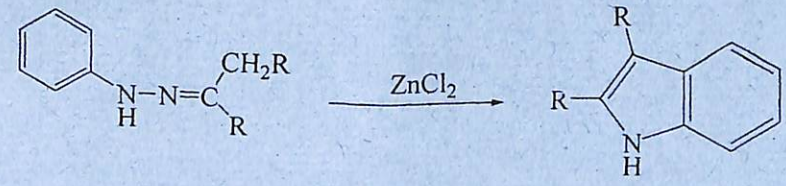
(d) (i) Give reasons for the following : 2+1+2=5

(a) Furan shows Diels-Alder cycloaddition

(b) Pyrrole readily polymerizes in presence of mineral acids

(c) Pyridine is less reactive in compare with benzene towards electrophiles.

(ii) Write the steps involved in the following conversion. Also mention the name of the synthesis. 4+1=5



(e) (i) How many carbon atoms are present in sesqui and a diterpene ? Write a synthesis of geraniol. What products will be formed on ozonolysis of geraniol ? 1+3+1=5

(ii) Write *four* general properties of alkaloids. Mention a chemical test that is helpful in structue elucidation of an alkaloid. Draw the structure of nicotine and show how the nature of nitrogen atoms has been established. 2+1+1+1=5

(f) (i) Name the type of hygrine alkaloid and its biological source. 2

(ii) Write *two* medicinal importances each of hygrine and reserpine. 2+2=4

(iii) How is cocaine used as medicine ? 2

(iv) What is Emde's modification ? 2