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3 (Sem-4/CBCS) CHE HC

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 : $1 \times 7 =$
 - (a) Write *aciform* structure of nitromethan
 - (b) The aliphatic diazonium compounds are unstable, why ?
 - (c) What is special isoprene rule ?
 - (d) Mention *one* medicinal importance of nicotine.

Con

- (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.

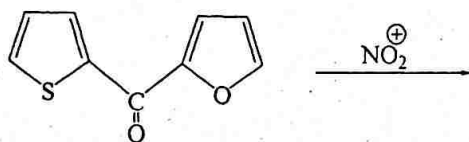
- (d) Write down the different steps involved in Bischler-Napieralski reaction leading to synthesis of isoquinoline.
- (e) How can you show that
- (i) α -terpineol is a 3° alcohol
 - (ii) geraniol has *E*-configuration
- (f) What product is formed in each case when citral is allowed to react with
- (i) NaOH (aq)
 - (ii) KHSO_4

3. Answer **any three** questions from the following : $5 \times 3 = 15$

- (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

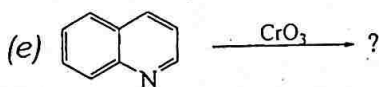
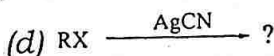
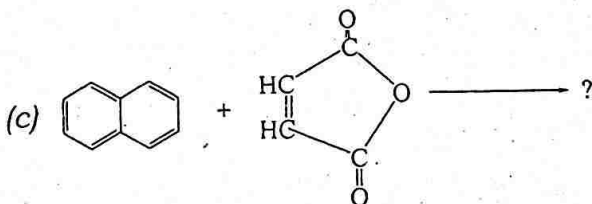
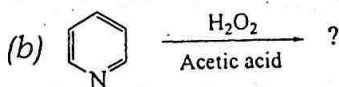
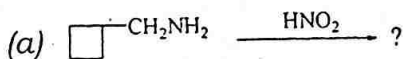
(c) Why does electrophilic substitution of Furan usually take place at C-2 position? Write Paal-Knorr synthesis of Furan. Write the product(s) of the following reaction. (structure and name). 2+2+1=5



(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) $\text{Na}_2\text{Cr}_2\text{O}_7 / \text{H}_2\text{SO}_4$
- (v) HNO_3 in glacial acetic acid

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



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

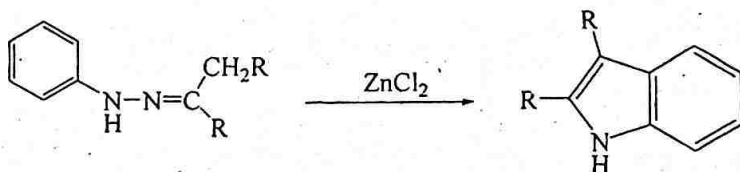
(iv) Explain the peri-hydrogen interaction in particularly in sulphonation of naphthalene. 3

(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 structure 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