2023

CHEMISTRY

Paper : CHMHC4096

(Organic Chemistry—III)

Full Marks : 60

Pass Marks : 24

Time : 3 hours

The figures in the margin indicate full marks for the questions

1. Choose the correct answer of the following (any *five*) : 1×5=5

(a) *n*-butyl bromide on heating with silver nitrite yields a mixture of

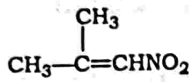
(i) 1-nitrobutane and *n*-butyl nitrite

(ii) 2-nitrobutane and *n*-butyl nitrite

(iii) 2,2-dinitrobutane and *n*-butyl nitrite

(iv) 1,4-dinitrobutane and *n*-butyl nitrite

(b) The IUPAC name of the compound



is

(i) 1-methyl-1-nitroprop-1-ene

(ii) 2-methyl-1-nitroprop-1-ene

(iii) 2-methyl-3-nitroprop-2-ene

(iv) 1-nitro-2-methylprop-3-ene

(c) Which of the following reactions will not give a primary amine?

(i) $CH_3CONH_2 \xrightarrow{Br_2/KOH}$

(ii) $CH_3CN \xrightarrow{LiAlH_4}$

(iii) $CH_3NC \xrightarrow{LiAlH_4}$

(iv) $CH_3CONH_2 \xrightarrow{LiAlH_4}$

(d) When a primary amine reacts with chloroform and ethanolic KOH, then the product formed is

(i) aldehyde

(ii) cyanide

(iii) isocyanide

(iv) alcohol

(e) Nitration of nitrobenzene yields

(i) 1,3,5-trinitrobenzene

(ii) *o*-dinitrobenzene

(iii) *p*-dinitrobenzene

(iv) *m*-dinitrobenzene

(f) All carbon atoms in naphthalene are

(i) *sp*-hybridized

(ii) sp^2-hybridized

(iii) sp^3-hybridized

(iv) dsp^2-hybridized

(g) How many resonance structures are there for naphthalene?

(i) 5

(ii) 4

(iii) 3

(iv) 2

(h) Anthracene undergoes electrophilic substitution mainly at

(i) C-9

(ii) C-1

(iii) C-1 and C-2

(iv) C-2

(i) Which of the following is not a five-membered ring?

(i) Pyridine

(ii) Pyrrole

(iii) Furan

(iv) Thiophene

(j) Quinine is obtained from the bark of which tree?

(i) Redwood

(ii) Banyan

(iii) *Eucalyptus*

(iv) *Cinchona*

2. Answer the following questions (any *five*) : 2×5=10

(a) Write one method of preparation of nitromethane. Write the reaction involved.

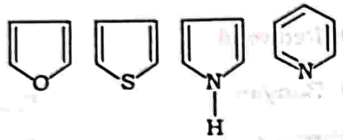
(b) During the nitration of benzene with a mixture of concentrated nitric acid and concentrated sulphuric acid, nitric acid acts as a base. Explain.

(c) What happens when a primary amine is heated with chloroform and alcoholic KOH? Write the reaction involved.

(d) Convert naphthalene into naphthol.

(e) Write the method of preparation of anthracene by using Diels-Alder reaction.

(f) Write the IUPAC names of the following :



(g) How are terpenes classified?

3. Answer the following questions (any *five*) : 5×5=25

(a) Write the chemical reactions of the following : 1×5=5

(i) Ethane nitrile is reduced with $LiAlH_4$.

(ii) Propane nitrile is treated with CH_3MgBr and the product is hydrolysed.

(iii) Propane nitrile is hydrolysed by dilute acid.

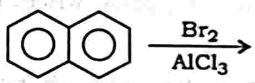
(iv) Ethyl bromide is treated with AgCN.

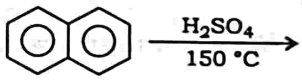
(v) Benzene diazonium chloride is treated with Cu_2Cl_2.

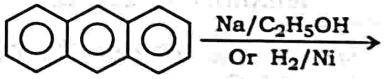
(b) What is aromatic diazonium salt? How is benzene diazonium chloride prepared in the laboratory? How do you get benzene from benzene diazonium chloride? 1+2+2=5

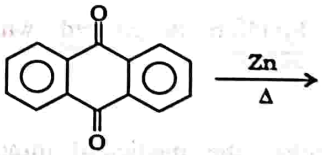
(c) Explain the structure of anthracene.

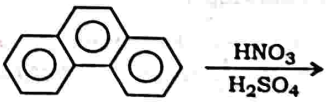
(d) Complete the following reactions : 1×5=5

(i) 

(ii) 

(iii) 

(iv) 

(v) 

(e) Write one method of preparation for each of the following (any *two*) :

(i) Furan

(ii) Thiophene

(iii) Pyrrole

(f) State what happens when (write the reactions also)—

(i) furan is treated with hydrogen in presence of Raney nickel;

(ii) thiophene is treated with bromine;

(iii) pyrrole is treated with acetic anhydride at 250 °C;

(iv) pyridine is heated with KOH at 300 °C;

(v) Pyridine is heated with HI at 300 °C.

(g) Mention the medicinal importance of the following :

Cocaine, Morphine, Nicotine, Quinine and Reserpine

(h) Explain isoprene rule. Write some properties of terpenoids. 3+2=5

(i) How will you convert the following (any *two*)?

(i) Benzene to *m*-Nitroaniline

(ii) Aniline to *p*-Bromoaniline

(iii) Aniline to Benzene

4. Answer the following questions (any *two*) : 10×2=20

(a) Explain the following : 2×5=10

(i) Toluene is more easily nitrated than benzene.

(ii) Aromatic primary amines cannot be prepared by Gabriel phthalimide reaction.

(iii) Pyrrole is a weak base.

(iv) Thiophene is more aromatic than pyrrole.

(v) In pyrrole, position 2 is more susceptible for electrophilic attack.

(b) (i) What are alkaloids? Give two examples. What are their main functions? Mention one physiological action of alkaloids. 1+1+2+1=5

(ii) What is citral? How can it be isolated? How will you establish the position of two carbon-carbon double bonds in citral molecule? Mention one use of citral. 1+1+2+1=5

(c) Write notes on the following :

(i) Hinsberg's method of distinguishing primary, secondary and tertiary amines 4

(ii) Coupling reaction. 2

(iii) Diazotization 2

(iv) Sandmeyer reaction 2

(d) Answer the following : 2×5=10

(i) With the help of a reaction, prove that pyridine ring is present in quinoline.

(ii) Pyridine is basic. Explain.

(iii) Explain the acidic behaviour of nitroalkane.

(iv) Why do aliphatic nitro compounds dissolve in aqueous solution?

(v) How can CH_3CN and CH_3NC be prepared?

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