2022

(February)

CHEMISTRY

(Honours)

(Part–B : Organic Chemistry—I)

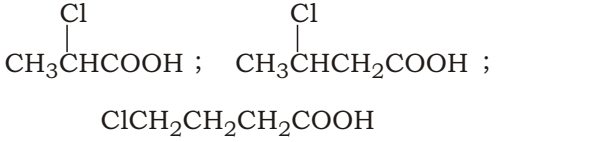
[Chem–H–501]

Marks : 37

Time : 2 hours

The figures in the margin indicate full marks for the questions

1. *(a)* Arrange the following acids in order of increasing acidity with appropriate explanation : 2

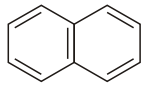


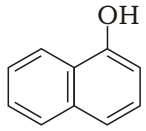
$CH_3\underset{Cl}{\underset{|}{C}}HCOOH$; $CH_3\underset{Cl}{\underset{|}{C}}HCH_2COOH$;

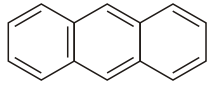
$ClCH_2CH_2CH_2COOH$

(b) Sulphonation of naphthalene at 80 °C takes place at C–1 whereas at 160 °C it takes place at C–2. Explain. 2

(c) Complete the following reactions : 1×3=3

(i)  $\xrightarrow[C_5H_{11}OH]{Na}$?

(ii)  + NH3 $\xrightarrow{(NH_4)_2SO_3}$?

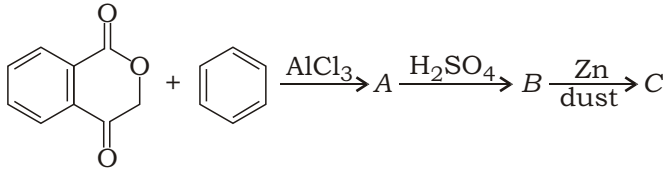
(iii)  $\xrightarrow[C_5H_{11}OH]{Na}$?

(d) Which is a stronger base of the following pair? Give reasons. 2

$C_6H_5NH_2$ and $C_6H_5CH_2NH_2$

OR

2. *(a)* Propose the structure *A*, *B* and *C* in the following reaction : 3



(b) Arrange the following molecules in order of increasing acid strength. Give reasons : 1×3=3

(i) $CH_3—CH=CH—COOH$;
$CH_3—CH_2—CH_2—COOH$;
$CH_3—C\equiv C—COOH$

(ii) $CH_3—NH_2$; $C_6H_5NH_2$

(iii) $CH_3—C\equiv CH$; $CH_3CH=CH_2$

(c) Starting from naphthalene, how can you prepare 1-naphthol? Give chemical equations. 2

(d) BF_3 is regarded as a Lewis acid. Explain why. 1

3. *(a)* Draw the conformational isomer of *n*-butane along with energy versus rotation diagram. 2+1=3

(b) Draw all the conformers of 1,4-dichloro-cyclohexane. Which is the most stable and why? 1+1=2

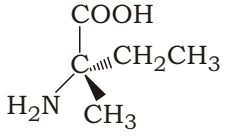
(c) Distinguish between relative and absolute configuration. 2

(d) What is synthetic rubber? Give one method of preparation of neoprene. 2

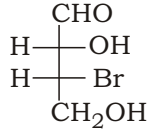
OR

4. *(a)* Assign *R*/*S* configuration for the following molecules : 1+1=2

(i)



(ii)



(b) What are dienes? Give one example each of isolated and cumulated diene. 1+1+1=3

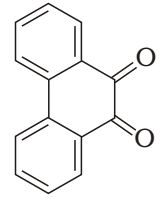
(c) How is nylon-6,6 prepared from adipic acid and hexamethylenediamine? 2

(d) Outline a mechanistic pathway for the acid catalyzed cationic addition polymerization of alkylated ethylene. 2

5. *(a)* What are acetals and ketals? Giving chemical equation, show the formation of an acetal. 1+2=3

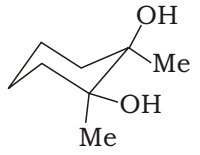
(b) Write the products of the following reactions with mechanism (any *two*) : 1½×2=3

(i)



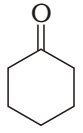
$\xrightarrow[(2)\ H_3O^+]{(1)\ NaOH}$?

(ii)



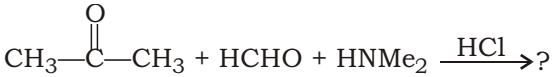
$\xrightarrow{H^+}$?

(iii)



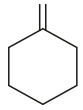
+ N_3H $\xrightarrow{H_2SO_4}$?

(c) What is a Mannich base? Complete the following reaction with mechanism : 1+2=3



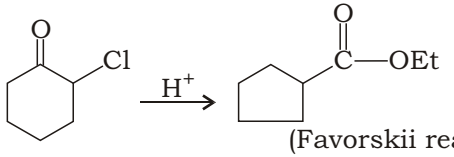
OR

6. (a) How will you synthesize the following compounds? 1½×2=3

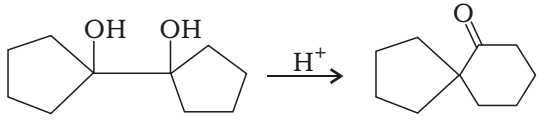
(i)  by Wittig reaction

(ii)  CH_3 from benzene by Friedel-Craft reaction

(b) How will you bring about the following transformations? 1½×2=3

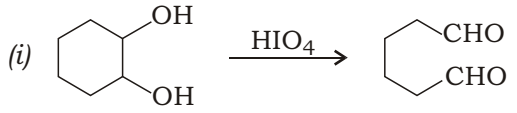
(i) 

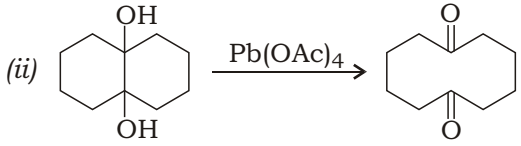
(Favorskii reaction)

(ii) 

(Pinacol-Pinacolone reaction)

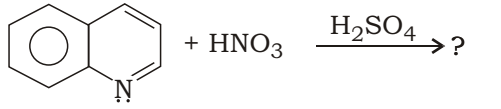
(c) Suggest the mechanism for the following reactions : 1½×2=3

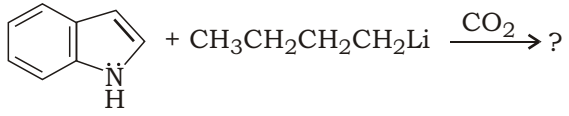
(i) 

(ii) 

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

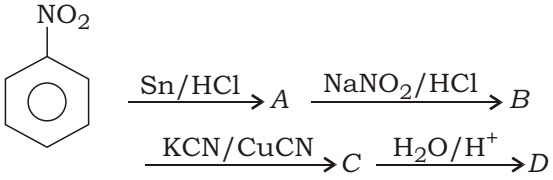
(b) Suggest the product of the following reactions with mechanism : 1½×2=3

(i) 

(ii) 

(c) State and explain any two basic principles of green chemistry. 1½+1½=3

(d) Identify the missing products of the following reaction : 2



OR

8. *(a)* What are solvent-free reactions? Give a suitable example of the reaction. Mention one advantage of these reactions. 1½+1+1=3½

(b) How is indole prepared by Fischer synthesis? 2

(c) How will you carry out the following conversions? 1½×3=4½

(i) Aniline to phenol

(ii) $CH_3CH_2NH_2$ CH_3COOH

(iii) C_6H_5Br C_6H_5COOH

★ ★ ★