2022

(CBCS)

(5th Semester)

CHEMISTRY

SIXTH PAPER

(Organic Chemistry—II)

Full Marks : 75

Time : 3 hours

The figures in the margin indicate full marks for the questions

(SECTION : A—OBJECTIVE)

(*Marks* : 10)

Tick (✓) the correct answer in the brackets provided : 1×10=10

1. If any two atoms or groups bonded to a chiral carbon atom are interchanged on Fischer projection formula, the resulting isomer is called

(a) enantiomers ( )

(b) diastereomers ( )

(c) racemates ( )

(d) metamers ( )

2. Which type of isomerism is given by $(CH_3)_2C = CH - CH(CH_3) - COOH$?

(a) Geometrical isomerism ( )

(b) Optical isomerism ( )

(c) Tautomerism ( )

(d) Both *(a)* and *(b)* ( )

3. The stability of conformation of cyclohexane decreases in the order

(a) chair half chair boat twist boat ( )

(b) chair boat twist boat half chair ( )

(c) chair twist boat boat half chair ( )

(d) boat twist boat chair half chair ( )

4. The most stable conformation of 1-chlorocyclohexane is

I *II* *III* *IV*

(a) *I* ( )

(b) *II* ( )

(c) *III* ( )

(d) *IV* ( )

5. Which one of the following has least resonance energy?

(a) Pyrrole ( )

(b) Furan ( )

(c) Thiophene ( )

(d) Pyridine ( )

6. Pyridine is a stronger base than pyrrole because

(a) pyrrole is only a five-membered heterocycles ( )

(b) lone pair of N-atom in pyridine is involved in delocalization ( )

(c) lone pair of N-atom in pyrrole is involved in delocalization ( )

(d) N-atom in pyrrole is sp^2-hybridized ( )

7. A six-membered cyclic transition state is observed in the mechanism of

(a) Clemmensen reduction ( )

(b) Perkin reaction ( )

(c) benzoin condensation ( )

(d) aldol condensation ( )

8. The reactivity of methylene group (—CH_2) in active methylene compound is due to

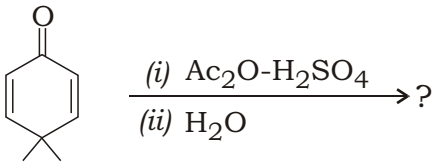
(a) +I effect ( )

(b) –I effect ( )

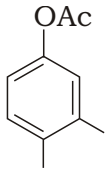
(c) both –I and –R effects ( )

(d) +R effect ( )

9. The product obtained from the following reaction



is

(a) 

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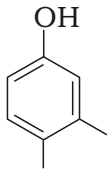
(b) 

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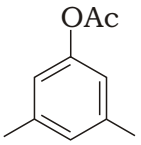
(c) 

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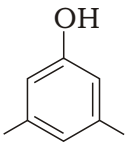
(d) 

( )

10. The major product in Friedel-Crafts alkylation reaction using branched alkyl halide is primarily determined by

(a) stability of carbanion ( )

(b) stability of carbocation ( )

(c) reactivity of the substrate ( )

(d) nature of solvent ( )

(SECTION : B—SHORT ANSWER)

(*Marks* : 15)

Answer the following : 3×5=15

UNIT—I

1. Write a short note on geometrical isomerism in oximes.

OR

2. Explain the centre of symmetry by taking suitable example.

UNIT—II

3. Differentiate between conformations and configurations.

OR

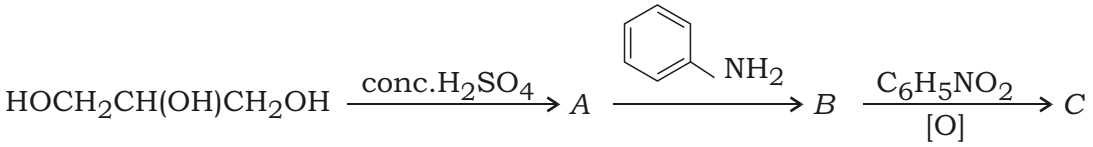
4. Explain 1,3-diaxial interactions in the conformations of cyclohexane.

UNIT—III

5. Pyridine undergoes electrophilic substitution at C-3, C-2 and C-4. Explain.

OR

6. Complete the following reaction :



UNIT—IV

7. Differentiate between resonance and tautomerism.

OR

8. "The -hydrogen atom of carbonyl compounds is acidic." Explain by taking suitable examples.

UNIT—V

9. Complete the following reaction :

$$CH_3Br + PPh_3 \longrightarrow A \xrightarrow{PhLi} B \xrightarrow{CH_3COCH_3} C + D$$

OR

10. Write $B_{AC}2$ mechanism for the hydrolysis of an ester.

(SECTION : C—DESCRIPTIVE)

(*Marks* : 50)

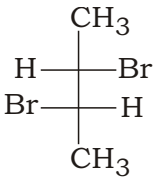
Answer the following : 10×5=50

UNIT—I

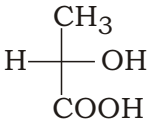
1. *(a)* What are diastereomers? Write two properties of diastereomers. 3

(b) Assign the *R*- and *S*-configuration of the following : 1×4=4

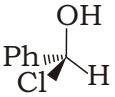
(i)



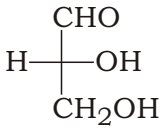
(ii)



(iii)



(iv)



(c) What do you mean by inversion of configuration? Explain how inversion of configuration can occur under S_N2 reaction. 3

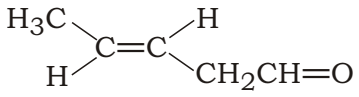
OR

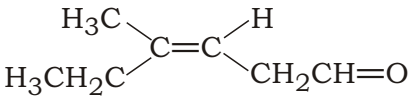
2. *(a)* Write short notes on the following : 2×2=4

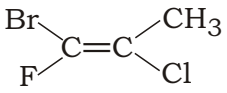
(i) Resolution of enantiomers

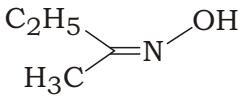
(ii) Structural isomerism

(b) Assign *E* or *Z* or syn- or anti-notation to the following : 1×4=4

(i) 

(ii) 

(iii) 

(iv) 

(c) What is optical activity? How do you account for the lack of optical activity in *meso*-compounds? 2

UNIT—II

3. *(a)* Draw the Newman and Sawhorse conformations of ethane with its potential energy diagram. Explain their stability. 3+2=5

(b) Draw the axial and equatorial bonds in boat and chair conformations of cyclohexane. 3

(c) Draw the most stable conformation of *t*-butyl cyclohexane showing all the axial and equatorial hydrogens. 2

OR

4. *(a)* Why is the axial methyl cyclohexane less stable than equatorial methyl cyclohexane? 2

(b) Draw and explain all the possible conformations of *n*-butane. Draw their potential energy diagram and explain their stability. 3+2=5

(c) Explain the following terms : 1×3=3

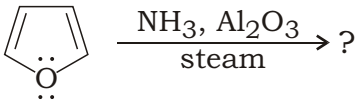
(i) Steric effect

(ii) Dipole-dipole interactions

(iii) Angle strain

UNIT—III

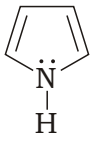
5. *(a)* Complete the following reactions (mechanism not required) : 1×3=3

(i)  $\xrightarrow[\text{steam}]{NH_3,\ Al_2O_3}$?

(ii) $(C_5H_8O_4)_n \xrightarrow{H_2O/H} \xrightarrow{CaO\ (350°C)}$?

(iii)  + $4\ddot{S}$ $\xrightarrow{650\ °C}$?

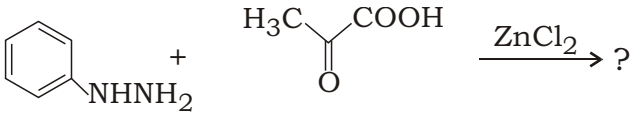
(b) Complete the following reaction with suitable mechanism : 3

 + Aq.K_2CO_3 ⟶ ?

(c) Write down the reaction with suitable mechanism for the synthesis of isoquinoline by Bischler-Napieralski method. 4

OR

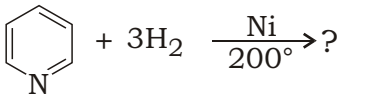
6. *(a)* Complete the following reaction with suitable mechanism : 4

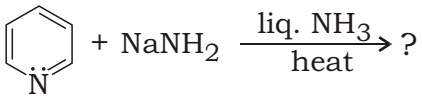


(b) Compare the basicity of pyridine and piperidine with suitable explanation. 3

(c) Complete the following reactions (mechanism not required) : 1×3=3

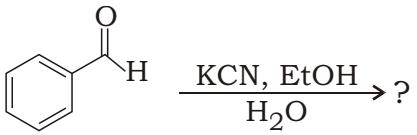
(i) 

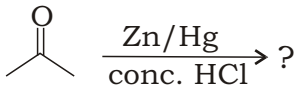
(ii) 

(iii) 

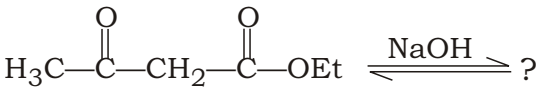
UNIT—IV

7. *(a)* Complete the following reactions giving suitable mechanisms and name the reactions : 3½×2=7

(i) 

(ii) 

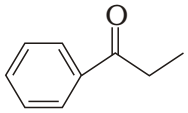
(b) What are active methylene compounds? Write the product of the following reaction : 3



OR

8. *(a)* Complete the following reactions giving suitable mechanisms and name the reactions : 3½×2=7

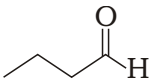
(i)  dil.NaOH → ?

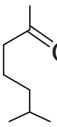
(ii)  $\xrightarrow[\ominus\ OH]{NH_2NH_2}$?

(b) Write and explain Perkin reaction. 3

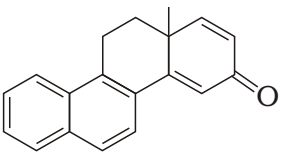
UNIT—V

9. *(a)* Write the products of the following reactions with suitable mechanisms (any *three*) : 3×3=9

(i)  + HOOC–CH$_2$–COOH $\xrightarrow{Et_2NH}$?

(ii)  + $BrCH_2COOEt$ $\xrightarrow[2.\ H_3O]{1.\ Zn/ether}$?

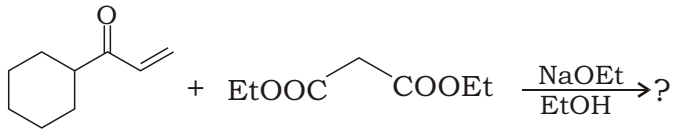
(iii)  + HCHO + $(CH_3)_2NH$ $\xrightarrow[MeOH,\ reflux]{HCl}$?

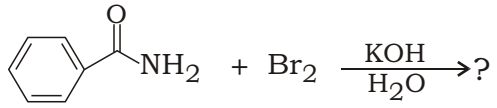
(iv)  $\xrightarrow[(CH_3CO)_2O]{H_2SO_4}$?

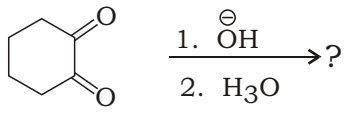
(b) What are ketals? 1

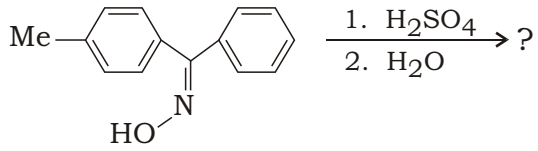
OR

10. *(a)* Write the products of the following reactions with suitable mechanisms (any *three*) : 3×3=9

(i) 

(ii) 

(iii) 

(iv) 

(b) What are carbanions? 1

★ ★ ★