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( CBCS )

( 5th Semester )

**CHEMISTRY**

SIXTH PAPER

**( Organic Chemistry—II )**

*Full Marks : 75*

*Time : 3 hours*

**( PART : A—OBJECTIVE )**

*( Marks : 25 )*

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

SECTION—A

*( Marks : 10 )*

Tick (✓) the correct answer in the brackets provided :

1×10=10

1. The number of stereoisomers possible in 3-bromo-2-iodobutane is

(a) 2 ( ) (b) 4 ( )

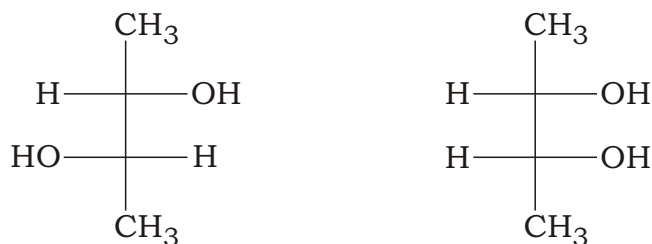
(c) 3 ( ) (d) 5 ( )

2. The net optical rotation of racemic mixture is

(a) zero ( ) (b) +90° ( )

(c) -90° ( ) (d) 120° ( )

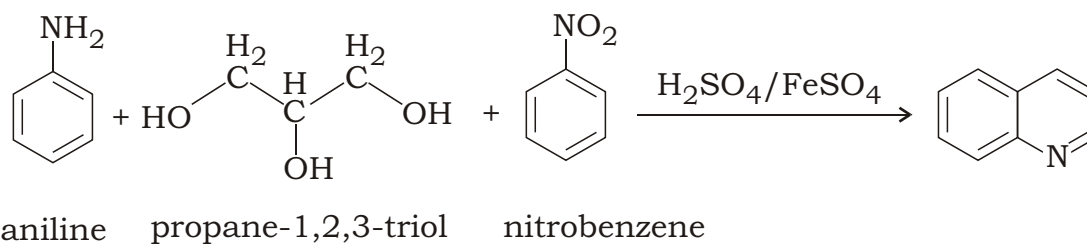
3. The two isomers given below



are

- (a) enantiomers ( )  
 (b) mesomers ( )  
 (c) position isomers ( )  
 (d) diastereomers ( )
4. *Cis*-1,3-dimethyl cyclohexane is
- (a) optically active ( )  
 (b) optically inactive ( )  
 (c) racemic mixture ( )  
 (d) enantiomer ( )

5. The conversion of



is known as

- (a) Fischer indole synthesis ( )  
 (b) Skraup synthesis ( )  
 (c) Bischler-Napieralski synthesis ( )  
 (d) Friedel-Crafts reaction ( )

6. For furan, electrophilic substitution occurs preferentially at the 2-position because
- (a) 2-position is easier to reach ( )
  - (b) 4-position is difficult to reach ( )
  - (c) 2-position is more stabilized than 3-position ( )
  - (d) 2-position is more stabilized than 5-position ( )
7. The reduction of carbonyl groups of aldehydes and ketones to methylene groups with amalgamated zinc and concentrated hydrochloric acid is known as
- (a) Cannizzaro's reduction ( )
  - (b) Mannich reduction ( )
  - (c) Wolff-Kishner reduction ( )
  - (d) Clemmensen reduction ( )
8. In ethyl acetoacetate, keto-enol tautomerism exists in the ratio of
- (a) 90% : 10% ( )
  - (b) 80% : 20% ( )
  - (c) 60% : 40% ( )
  - (d) 20% : 80% ( )
9. The reaction of  $\alpha$ -haloesters with carbonyl compounds in presence of zinc to produce  $\beta$ -hydroxy-esters is known as
- (a) Claisen reaction ( )
  - (b) Mannich reaction ( )
  - (c) Reformatsky reaction ( )
  - (d) Friedel-Crafts alkylation ( )
10. When aromatic aldehydes or ketones react with aliphatic aldehydes or ketones or esters having  $\alpha$ -hydrogens with weak base (i.e., 10% NaOH) and low temperature, a crossed aldol condensation with subsequent dehydration occurs predominantly with the formation of  $\alpha, \beta$ -unsaturated aldehydes, ketones or esters. This reaction is known as
- (a) Knoevenagel reaction ( )
  - (b) Michael reaction ( )
  - (c) aldol condensation reaction ( )
  - (d) Claisen-Schmidt reaction ( )

SECTION—B

( Marks : 15 )

Answer the following questions :

3×5=15

1. What is the essential condition for a compound to be chiral? Justify your answer with an example.

**OR**

Define stereogenic centre. Draw all the possible stereoisomers of tartaric acid.

2. Differentiate between conformation and configuration.

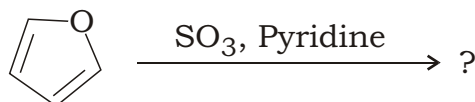
**OR**

Draw all the conformational isomers of ethane. Indicate the most stable and the least stable conformer.

3. Compare between the basicity of pyrrole and pyridine.

**OR**

Predict the product and write the mechanism for the following :



4. Differentiate between tautomerism and resonance.

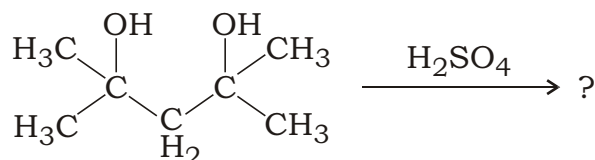
**OR**

Explain the acidity of  $\alpha$ -hydrogen in carbonyl compound.

5. How does base catalyzed hydrolysis of ester take place by  $B_{AC}2$  mechanism?

**OR**

Complete the following reaction :



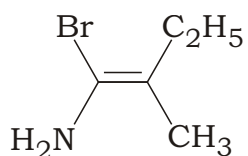
( PART : B—DESCRIPTIVE )

( Marks : 50 )

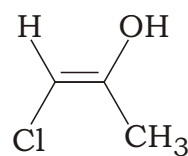
The figures in the margin indicate full marks for the questions

1. (a) Explain axis of symmetry with a suitable example. 2

(b) Assign *E*- and *Z*-configuration to the following molecules : 2



(i)



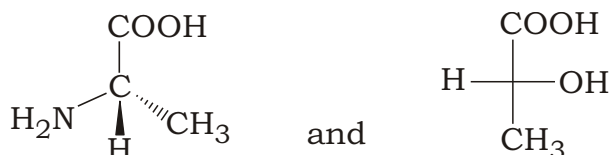
(ii)

(c) Write the difference between *meso*-compound and racemic mixture with suitable example. 2+2

(d) Show inversion of configuration with appropriate example. 2

OR

2. (a) Assign *R*- and *S*-configuration to the following : 2



(b) Write all the possible stereoisomers of 2,3-dichlorobutane. Identify the *meso*-isomer and support your answer with explanation. 3

(c) The observed rotation of 10 ml of a solution containing 2.0 gm of a compound when placed in 25 cm long polarimeter tube is +134°. What is the specific rotation of the compound? 3

(d) Explain any *one* of the following with suitable example : 2

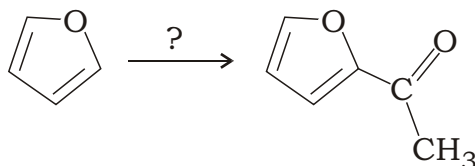
(i) Diastereomers

(ii) Optical activity

3. (a) What is the interaction encountered in methyl cyclohexane when methyl group is in the axial position? Illustrate and explain. 3
- (b) Draw the Newman projection formula for boat and chair conformation of cyclohexane indicating all the hydrogens. Indicate the most stable conformation and justify. 3
- (c) By drawing Newman projection formula, show how the potential energy changes occur in *n*-butane when the molecule is rotated around its C<sub>2</sub>—C<sub>3</sub> bond axis through a complete cycle. 4

**OR**

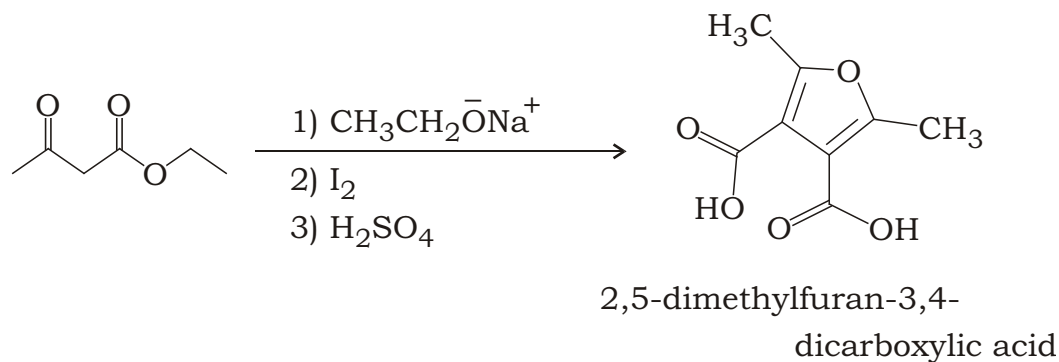
4. (a) Write all the important conformations of 1,2-dimethylcyclohexane. Which is the most stable conformer and why? 3
- (b) What are meant by angle strain, rotational strain and steric strain in a molecule? 3
- (c) Draw Newman and Sawhorse formula for the different conformational isomers of ethane. Explain their stability. 3
- (d) Draw the chair conformation of *trans*-1,3-dimethylcyclohexane. 1
5. (a) How will you synthesize pyrrole by Paal-Knorr synthesis method? Show the reaction pathway and the mechanism involved in it. 5
- (b) Predict the reagent and write the reaction mechanism for the following : 5



**OR**

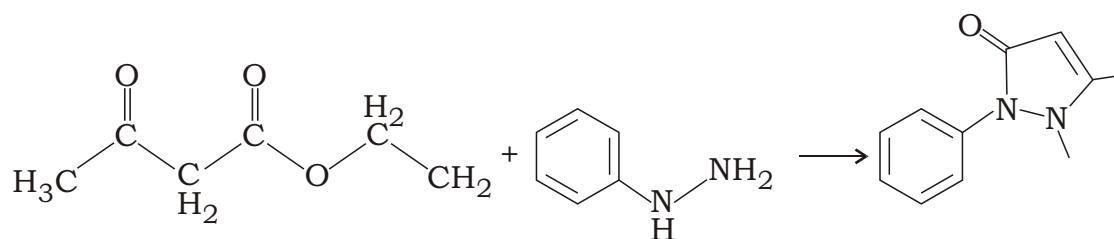
6. (a) Compare the basicity of pyridine and piperidine. 3

(b) Write the reaction mechanism for the following reaction : 5



(c) Why is pyrrole a weak base? 2

7. (a) Write the mechanism for the following transformation : 5



(b) What are the five reactions supporting the existence of keto-form of ethyl acetoacetate? 5

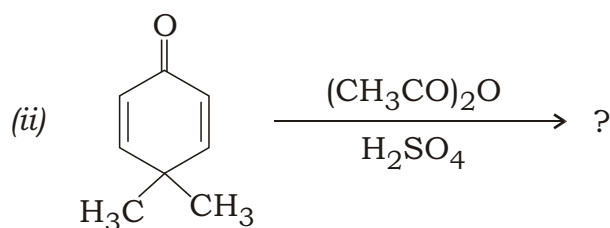
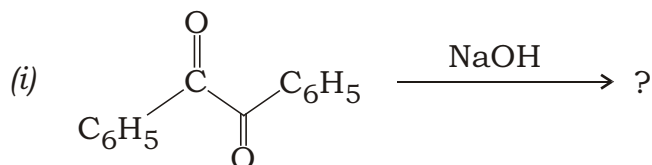
**OR**

8. (a) What are the reactions supporting the existence of enol-form of ethyl acetoacetate? 5

(b) What are the properties of the two tautomeric forms of ethyl acetoacetate? How will you separate the keto- and enol-form of ethyl acetoacetate? 5

9. (a) Discuss Friedel-Crafts acylation reaction with suitable example and reaction mechanism. 4

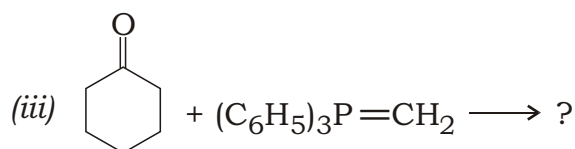
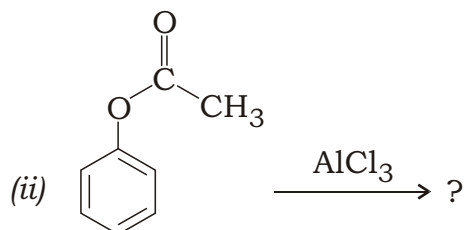
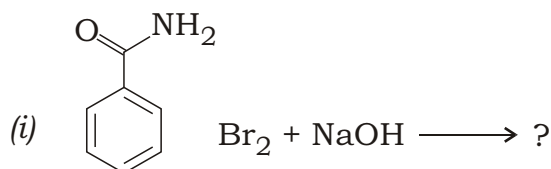
(b) Complete the following reactions and verify your answer with reaction mechanism : 3×2=6



OR

10. (a) Write the Mannich reaction mechanism with suitable example. 3

(b) Complete any two of the following reactions with mechanism : 2½×2=5



(c) What are acetals and ketals? 2

★ ★ ★