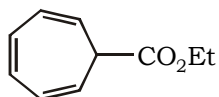


(iii) Show how the following compound can be synthesized in one step from benzene. Give the mechanism of the reaction.



4+3+3

B.Sc. 1st Semester (Honours) Examination-2022-23

CHEMISTRY

Course ID : 11411 Course Code : SH/CHEM/101/C-1

Course Title : Organic Chemistry I (New)

Time : 1 Hour 15 Minutes

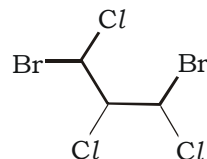
Full Marks : 25

The figures in the right hand margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

1. Answer any *five* questions : 1×5 = 5
- (a) Draw the valence bond (VB) orbital picture of vinyl cyanide indicating the states of hybridization of all the atoms.
 - (b) Calculate the formal charges of all atoms in the species : $[\text{CH}_3]^\ominus$
 - (c) Give Evidences in favor of steric inhibition of resonance.

- (d) Chloropentane has higher boiling point than pentane explain.
- (e) Draw two meso stereoisomers of the following compound.

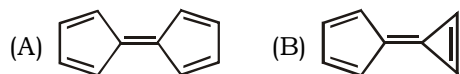


- (f) Draw symmetry elements and find out the point group in allene.
- (g) Define specific rotation with the formula and explain meaning of all the term.
- (h) Arrange the following carbocations in order of increasing stability and give reasons.



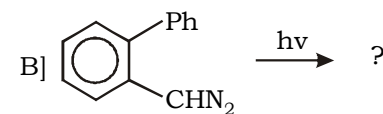
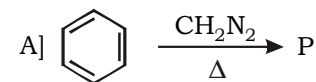
2. Answer any *two* questions : 5×2=10

- (a) (i) Which one of the following compounds possesses higher dipole moment and why? 2



- (iv) Outline the chemical method of resolution of (\pm)-2-hexanol. 2+3+2+3

- (b) (i) When *cis*-2-butene and *trans*-2-butene separately reacts with CH_2Cl_2 in the presence of Zn/Cu couple, both *cis*- and *trans*-products are obtained. Predict the products and give reason.
- (ii) Predict the product(s) in the following reactions showing intermediate(s) if any and provide explanation in each case.

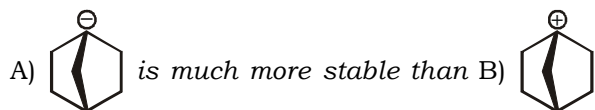


(d) Explain the following observations :

(i) $[\dot{\text{C}}\text{H}_3]$ radical is trigonal planar while the $[\dot{\text{C}}\text{F}_3]$ (trifluoromethyl) radical is pyramidal in shape.

(ii) The stability of triphenylmethyl radical is $[\text{Ph}_3\dot{\text{C}}]$ is much less than that expected.

(iii) Explain why :



2+1+2

3. Answer any *one* question :

10×1=10

(a) (i) What is meant by racemization and resolution?

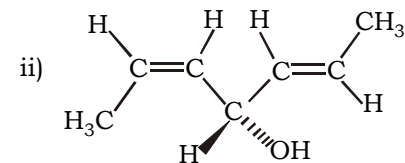
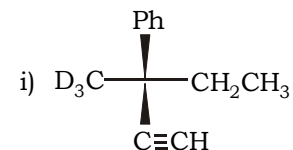
(ii) Explain : (+)- α -Phenyl ethyl alcohol loses its optical activity in the presence of acid.

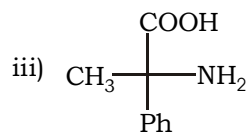
(iii) Specific rotation of an enantiomeric mixture is (+) 15° and that of the pure laevo rotatory enantiomer is (–) 60° , Find out the optical purity of the sample and also the percentage composition of the two enantiomers present.

(ii) Define heat of combustion. Match the following heats of combustion values : 3375 kJ/mole, 3369 kJ/mole, 3365 kJ/mole, 3361 kJ/mole and 3355 kJ/mole, with the following alkenes : *cis*-2-pentene, *trans*-2-pentene, 2-methyl-1-butene, 1-pentene, 2-methyl-1-butene. 1+2

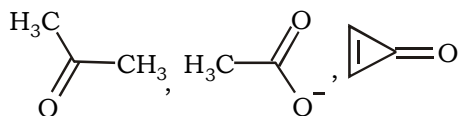
(b) (i) Give one example in each case : asymmetric molecule and dissymmetric molecule. What is the difference between molecular asymmetry and dissymmetry? 1+1

(ii) Assign R/S-descriptors for the chiral centers in the following compounds clearly indicating the priority of ligands. 3

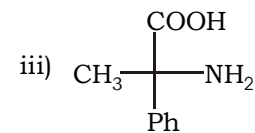
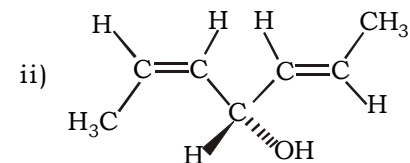
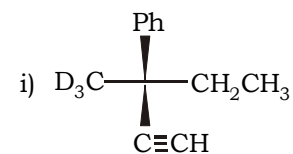
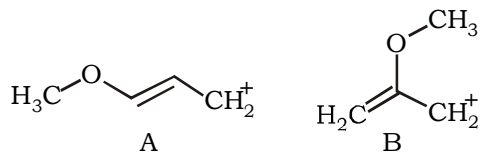




- (c) (i) Define electrophiles and nucleophiles based on FMO theory. 2
- (ii) What is meant by homolytic bond fission and homogenic bond formation? Give mechanism and explain with suitable examples in each case. 3
- (d) (i) Compare C=O bond distance : 2



- (ii) Which of the following carbocations is more stable? 2



(1+1)+3

- (c) (i) Define electrophiles and nucleophiles based on FMO theory.
- (ii) What is meant by homolytic bond fission and homogenic bond formation? Give mechanism and explain with suitable examples in each case.

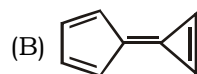
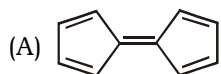
2+3

- (h) Arrange the following carbocations in order of increasing stability and give reasons.



2. Answer any *two* questions : 5×2=10

- (a) (i) Which one of the following compounds possesses higher dipole moment and why?



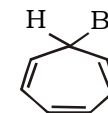
- (ii) Define heat of combustion. Match the following heats of combustion values : 3375 kJ/mole, 3369 kJ/mole, 3365 kJ/mole, 3361 kJ/mole and 3355 kJ/mole, with the following alkenes : *cis*-2-pentene, *trans*-2-pentene, 2-methyl-2-butene, 1-pentene, 2-methyl-1-butene.

2+(1+2)

- (b) (i) Give one example in each case : asymmetric molecule and dissymmetric molecule. What is the difference between molecular asymmetry and dissymmetry?
- (ii) Assign R/S-descriptors for the chiral centers in the following compounds clearly indicating the priority of ligands.

- (iii) Most alkyl bromides are water-insoluble liquids. Yet, 7-bromo-1,3,5-cycloheptatriene is highly water soluble and behaves like a salt. Explain.

1

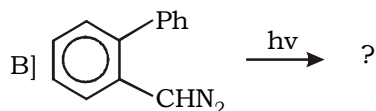
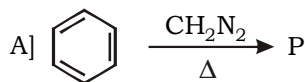


3. Answer any *one* question : 10×1=10

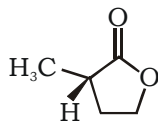
- (a) (i) Draw Flying wedge, sawhorse, and Newman projection of (2S, 3R)-2-chlorobromopentane.
- (ii) What is the relationship between the specific rotations of (A) (2R, 3R)-dichloropentane and (2S, 3S) -dichloropentane, (B) (2R, 3S) -dichloropentane and (2R, 3R)-dichloropentane?
- (iii) Specific rotation of an enantiomeric mixture is (+) 15° and that of the pure laevo rotatory enantiomer is (–) 60°, Find out the optical purity of the sample and also the percentage composition of the two enantiomers present.
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(ii) Predict the product(s) in the following reactions showing intermediate(s) if any and provide explanation in each case.



(iii) This compound racemizes in base. Why is that?



4+3+3

Course Title : Organic Chemistry I (Old)

1. Answer any *five* questions : 1×5=5

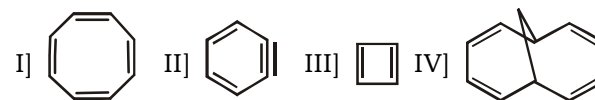
(a) Draw the valence bond (VB) orbital picture of vinyl cyanide indicating the states of hybridization of all the atoms.

(b) Calculate the formal charges of all atoms in the species : $[\text{CH}_3]^\ominus$

(c) Give Evidences in favor of steric inhibition of resonance.

(d) Draw the Frost diagram for cyclopentadienyl cation and show its antiaromaticity.

(e) 'Among the following compounds, which one is non-aromatic and why?'



(f) Draw symmetry elements and find out the point group in allene.

(g) Define specific rotation with the formula and explain meaning of all the term.