Total No. of Printed Pages—8

2 SEM TDC CHMH (CBCS) C 3

2023

(May/June)

CHEMISTRY

(Core)

Paper : C–3

(Organic Chemistry)

Full Marks : 53

Pass Marks : 21

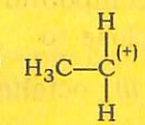
Time : 3 hours

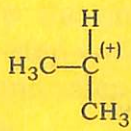
The figures in the margin indicate full marks for the questions

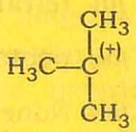
1. Choose the correct answer from the following : 1×5=5

(a) Which is the most stable carbocation among the following?

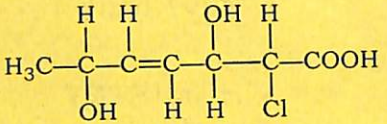
(i) $H_3C^{(+)}$

(ii) 

(iii) 

(iv) 

(b) How many chiral carbons are present in the given molecule?



(i) 1

(ii) 2

(iii) 3

(iv) None of the above

(c) The reagent used in Corey-House synthesis is

(i) R_2CuLi

(ii) Li_2CuCl_4

(iii) RCuLi

(iv) R_2CuLi_2

(d) According to Baeyer's strain theory, cyclopentane is most stable cyclic compound because its bond angles are close to

(i) octahedral

(ii) tetrahedral

(iii) pentahedral

(iv) None of the above

(e) Which one of the following does not give isopropylbenzene as a product upon reaction with benzene?

(i) $(CH_3)_2CHCl/AlCl_3$

(ii) $CH_3CH_2CH_2Cl/AlCl_3$

(iii) $CH_3CH=CH_2/H_3PO_4$

(iv) $(CH_3)_2C=CH_2/H_3PO_4$

UNIT—I

2. Answer the following questions : 2×3=6

(a) Define electrophilic reagent and nucleophilic reagent. Select the electrophilic and nucleophilic reagent from the following :

H_3O^+, H_2O, BF_3, CH_3OH

(b) Benzyl carbocation is more stable than propyl carbocation. Explain.

Or

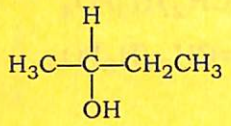
CO_2 is a non-polar molecule but SO_2 is a polar molecule. Explain.

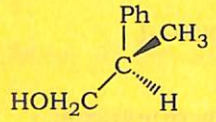
(c) Draw the energy profile diagram for a two-step endothermic reaction in which second step is the rate determining step.

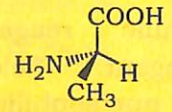
UNIT—II

3. Answer the following questions : 2×6=12

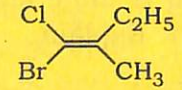
(a) Specify the following stereoisomers as *R* and *S* (any *two*) : 1×2=2

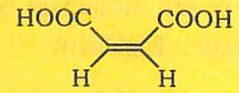
(i) 

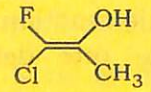
(ii) 

(iii) 

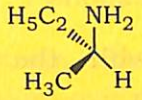
(b) Specify the following geometrical isomers as *E* and *Z* (any *two*) : 1×2=2

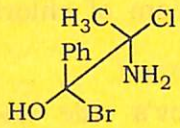
(i) 

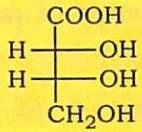
(ii) 

(iii) 

(c) Interconvert the following projections as directed (any *two*) : 1×2=2

(i)  to Fischer projection

(ii)  Sawhorse to Newman to Fischer

(iii)  Fischer to Newman to Sawhorse

(d) Explain why racemic tartaric acid can be resolved but not *meso*-tartaric acid. Give the chemical method of resolution. 2

(e) A 1·5 g of organic compound was dissolved in 10 ml of alcohol and placed the sample cell of 5 cm path length. The observed rotation of sodium *D*-line was 1·21°. Calculate the specific rotation of the compound. 2

(f) Describe the necessary conditions for a molecule to exhibit optical isomerism. 2

UNIT—III

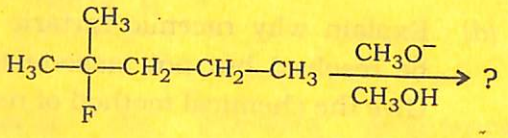
4. Answer the following questions :

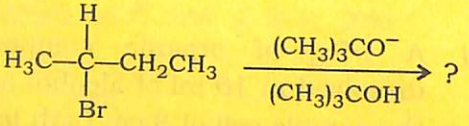
(a) Prepare toluene with the help of Wurtz-Fittig reaction. 2

(b) Give the mechanism of chlorination of methane. 2

(c) State Markovnikov's rule and explain the mechanism of addition of HBr to propene in the presence of peroxide. 1+2=3

(d) Write the product(s) of the following elimination reactions : 1½×2=3

(i) 

(ii) 

(e) Which dienophile is more reactive in Diels-Alder reaction? 2

$CH_2=CHCHO$ *or* $CH_2=CHCH_2CHO$

(f) What happens when 1,3-butadiene is treated with HBr? 2

(g) How will you distinguish between 1-butyne and 2-butyne? 2

Or

Illustrate the mechanism of hydro-boration-oxidation reaction.

UNIT—IV

5. *(a)* According to Baeyer's angle strain theory, cyclopentane is more stable than cyclohexane but practically cyclo-hexane is more stable. Explain. 2

(b) Draw the different conformations of *n*-butane (Newman projection formula) and show which one is most stable. 2

(c) How will you synthesize cyclopentane from diethyl adipate? 2

(d) Draw the energy profile diagram for the conformations of cyclohexane. 2

Or

Chair conformation of cyclohexane is more stable than boat conformation. Explain.

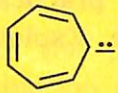
UNIT—V

6. *(a)* Which of the following compounds are aromatic, anti-aromatic and non-aromatic? 2

(i) 

(ii) 

(iii) 

(iv) 

(b) Discuss the mechanism of sulphonation of benzene. 2

(c) Explain why nitration of chlorobenzene gives *ortho-* and *para*-chloronitrobenzene but the chlorination of nitrobenzene gives *meta*-chlorobenzene. 2

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