PG Odd Semester (CBCS) Exam., December—2017

CHEMISTRY

(1st Semester)

Course No. : CHMCC–102

(Organic Chemistry—I)

Full Marks : 70
Pass Marks : 28

Time : 3 hours

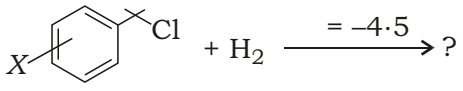
The figures in the margin indicate full marks for the questions

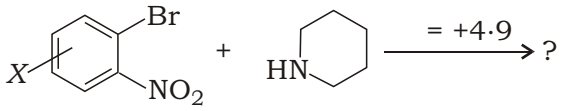
Answer **five** questions, selecting **one** from each Unit

UNIT—I

1. *(a)* Write the Hammett equation and explain all the terms involved including significance. 2

(b) Complete the following reactions and suggest the mechanisms with respect to values : 2+2=4

(i) 

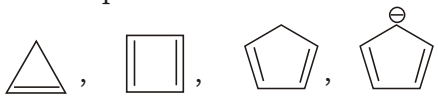
(ii) 

(c) What are annulenes? Comment on the aromaticity of 1,6-methano-[10] annulene. 1+2=3

(d) Explain how hyperconjugation is different from conjugation. 2

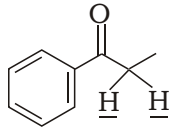
(e) What are the phase-transfer catalysts? Explain the role of crown ether as phase-transfer catalyst. 3

2. *(a)* Predict, which of the following is/are aromatic. Explain. 1+2=3



(b) How can carbon nanotubes be distinguished from C_{60} fullerenes? How can fullerenes be functionalized to make the water-soluble? 3+3=6

(c) On running NMR spectrum of the following compound in D_2O, signal of the underlined protons disappears slowly. Explain the phenomenon with suitable reactions. 3

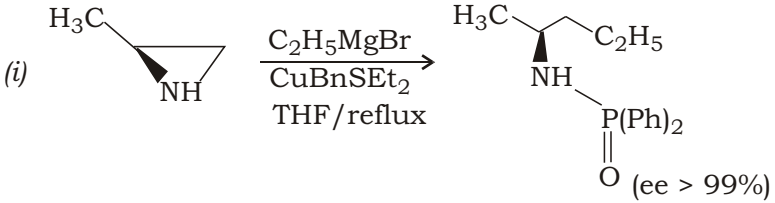


(d) What are catenanes? How can you synthesize [2] catenane? 2

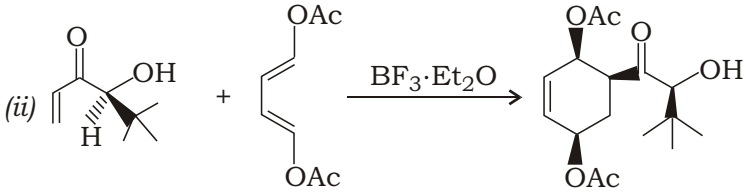
UNIT—II

3. *(a)* Identify the following reactions as enantioselective/diastereoselective or enantiospecific/diastereospecific reactions. Give reasons for your observation. 1+1=2

(i)

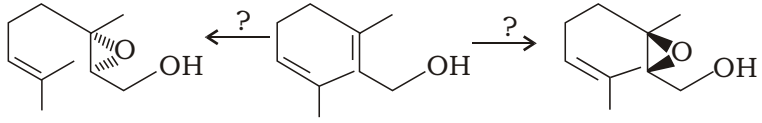


(ii)



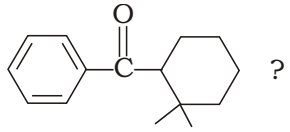
(b) What is the role of ferricyanide in the sharpless dihydroxylation reaction? Explain with example. 2

(c) Identify the reagents/products for the following asymmetric synthesis : 1½×2=3



(d) *(i)* How can OsO_4 be converted into a chiral catalyst? Explain the mechanism through the support of an asymmetric synthesis. 3½

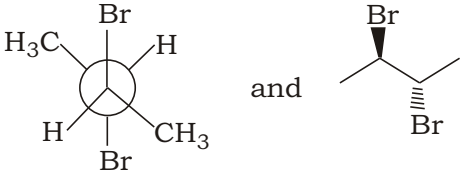
(ii) How can BH_3 be utilized to reduce ketones like



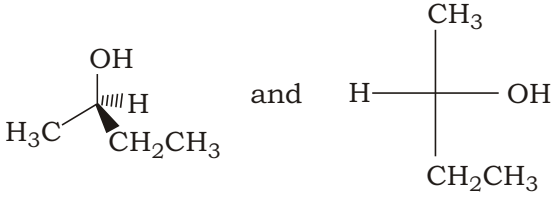
Provide the mechanism along with reagents and reaction conditions. 3½

4. *(a)* Identify the following pairs as enantiomers or diastereomers or identical : 1+1=2

(i)



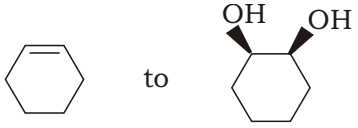
(ii)



(b) Provide the structures for the following along with the depiction of the exact stereochemistry : 2+2=4

(i) The chiral catalyst used for sharpless epoxidation

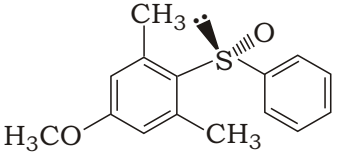
(ii) Chiral catalyst employed to convert



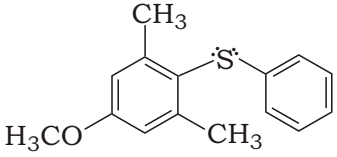
to

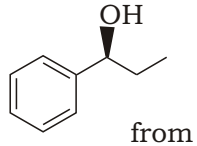
(c) Explain the mechanism of the epoxidation of  and explain the stereochemical considerations along with the changes in the oxidation states of the metal ions involved in the process. 2½+1=3½

(d) How can the following asymmetric synthesis be achieved? Suggest the correct reaction conditions / reagents / promoters / catalysts for them (mechanism is not required) : 1½×3=4½

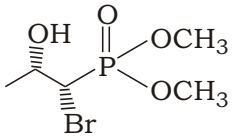
(i) 

from

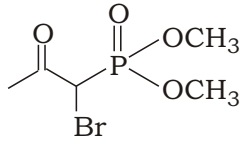


(ii) 

from the corresponding ketone

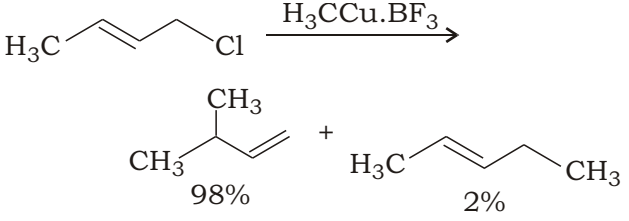
(iii) 

from

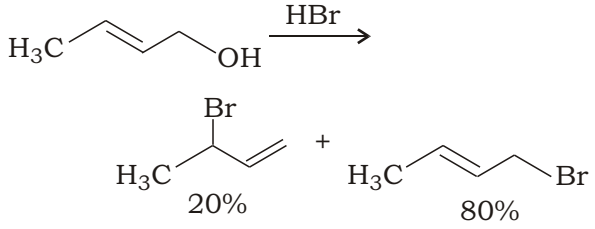


UNIT—III

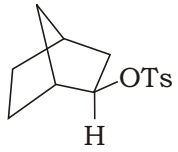
5. *(a)* Suggest the mechanism and comment on the yield of the products : 3+2=5



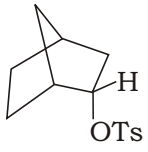
while



(b) Explain why isomer *(I)* undergoes acetolysis much faster than isomer *(II)*. Write the product and suggest mechanism : 3

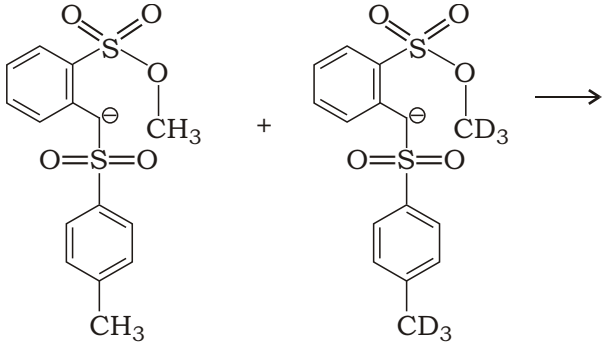


(I)

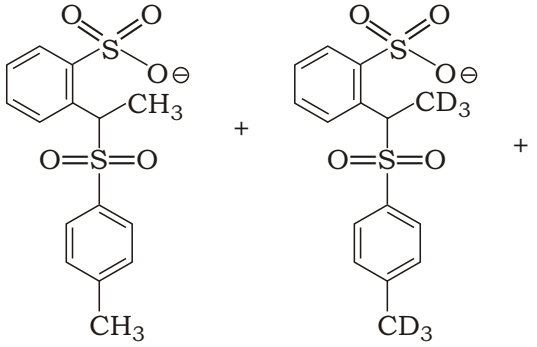


(II)

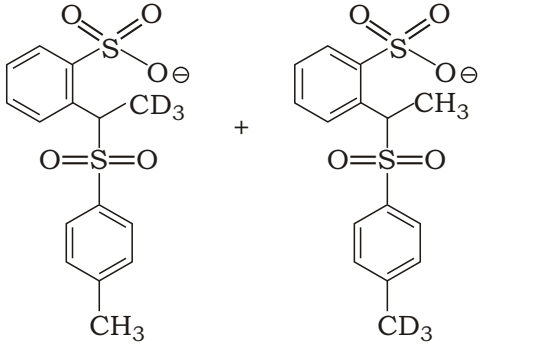
(c) Suggest the mechanism for the following reaction. Justify the formation of products : 4



1 : 1

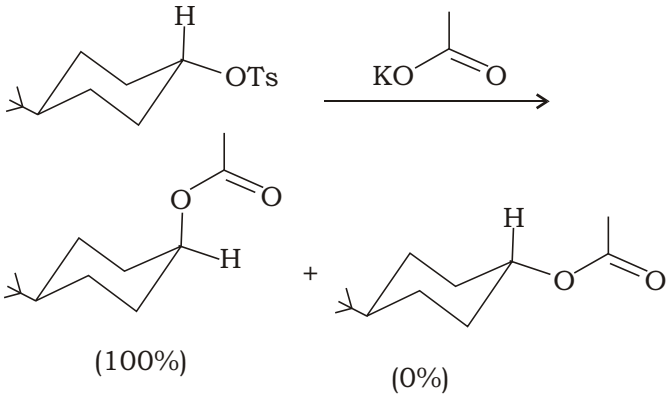


25% 25%



25% 25%

(d) Justify the yield of the following reaction : 2

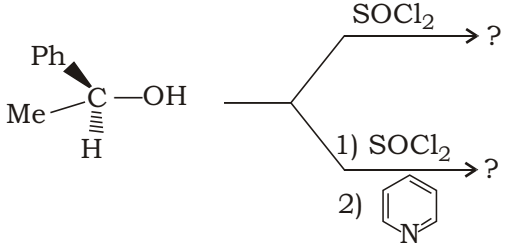


(100%) (0%)

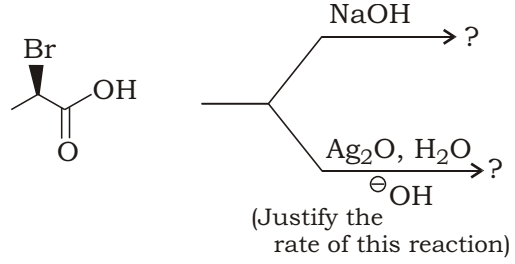
6. *(a)* Provide the mechanism of S_N1 reaction with the support of frontier orbital description. Comment on the stereochemistry of the products. 3+1=4

(b) Write the product(s) and suggest plausible mechanism for the following : 3+3+2=8

(i)

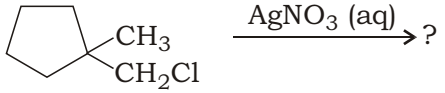


(ii)



(Justify the rate of this reaction)

(iii)

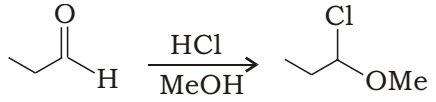


(c) What happens when sulfur mustard comes contact with moisture? 2

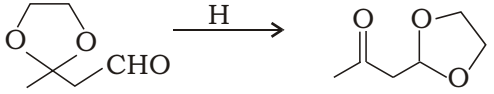
UNIT—IV

7. *(a)* Provide the mechanisms for the following reactions : 2×3=6

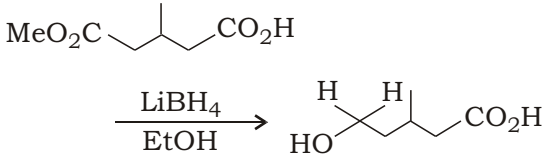
(i)



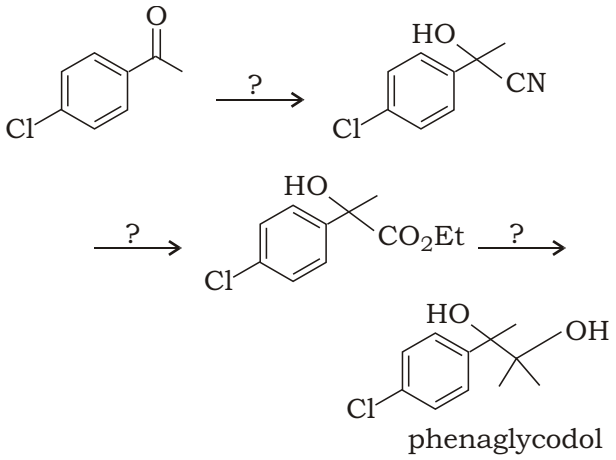
(ii)



(iii)



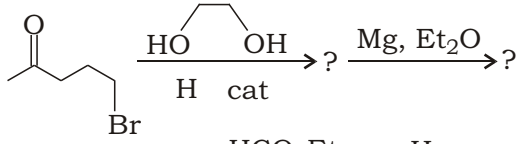
(b) Suggest reagents to make the drug 'phenaglycodol' by the route shown : 3

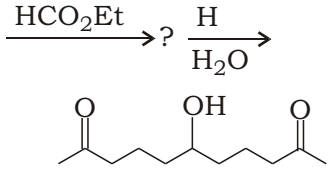


phenaglycodol

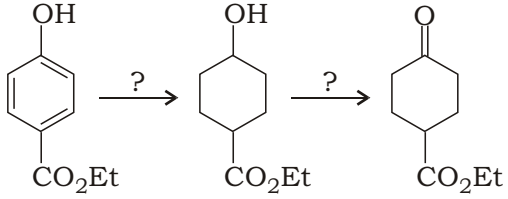
(c) Complete the followng reactions : 3+2=5

(i)



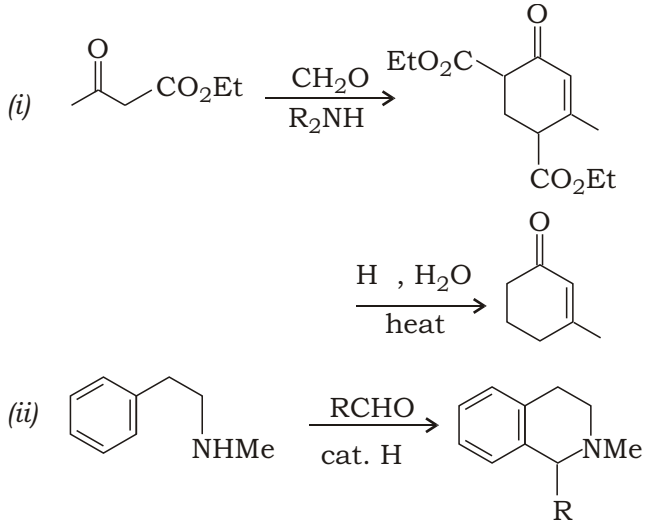


(ii)



8. *(a)* Provide mechanisms for the following reactions : 2+2=4

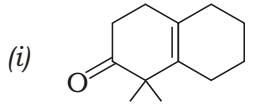
(i)



(ii)

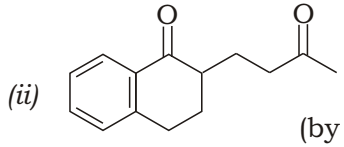
(b) Synthesize the following compounds as directed and show the mechanism : 3+2=5

(i)



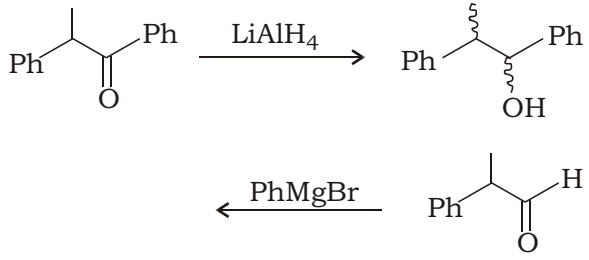
(by Robinson annelation)

(ii)

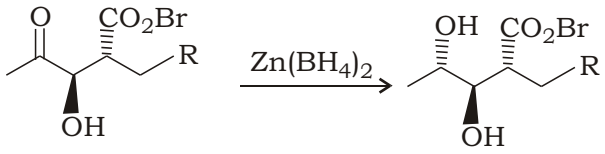


(by conjugate addition)

(c) Explain how these two reactions give different diastereomers : 3

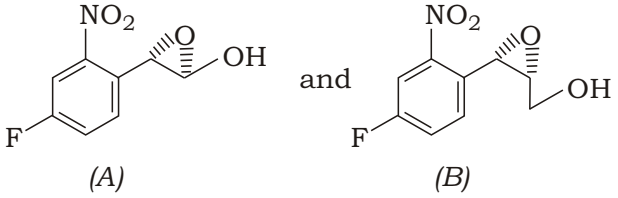


(d) Explain the stereoselectivity in the following reaction : 2



UNIT—V

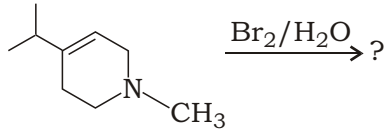
9. *(a)* What is regioselectivity? How does regioselectivity determine the reaction of CH_3MgI with species *(A)* and *(B)*? ½+1½=2



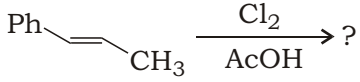
(A) *(B)*

(b) Provide the major prodcut(s) for the following reactions. Mention stereochemistry : 2+2+2+3=9

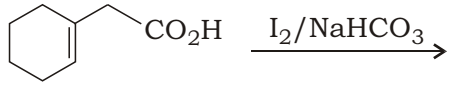
(i)



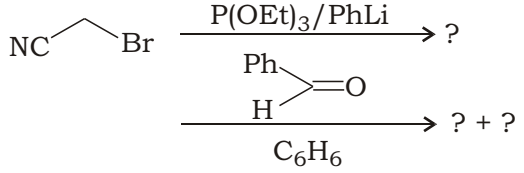
(ii)



(iii)



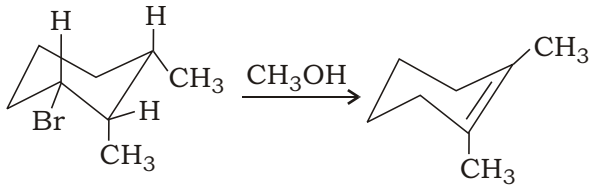
(iv)

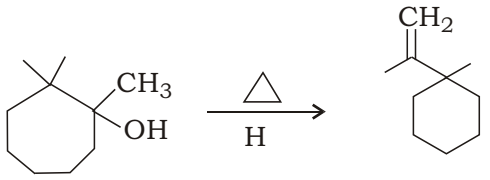


(c) Explain why, but-3-en-2-one undergoes carbonyl addition when treated with KCN/HCN, but undergoes 1,4-addition reaction when treated with malanonitrile/py. 3

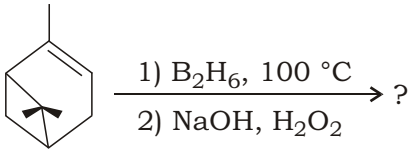
10. *(a)* Neomenthyl chloride undergoes *E*2-elimination reaction when treated with ethanolic NaOEt about 200 times faster than does menthyl chloride under same condition. Justify. 3

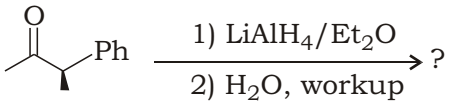
(b) Write the mechanisms of the following reactions : 2+2=4

(i) 

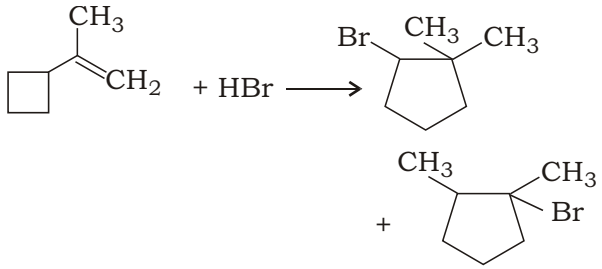
(ii) 

(c) Suggest the mechanism and identify the major product(s) : 2+2=4

(i) 

(ii) 

(d) Depict the mechanism for the following reaction : 3



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