



WEST BENGAL STATE UNIVERSITY  
B.Sc. Honours 2nd Semester Examination, 2019



CEMACOR04T-CHEMISTRY (CC4)

Time Allotted: 2 Hours

Full Marks: 40

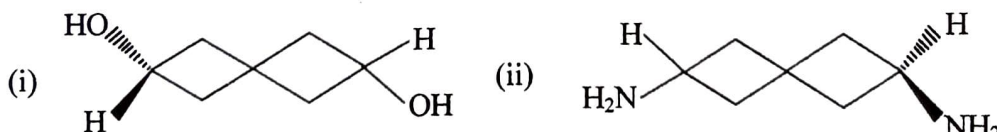
*The figures in the margin indicate full marks.  
Candidates should answer in their own words and adhere to the word limit as practicable.  
All symbols are of usual significance.*

Answer any *three* questions taking *one* from each unit

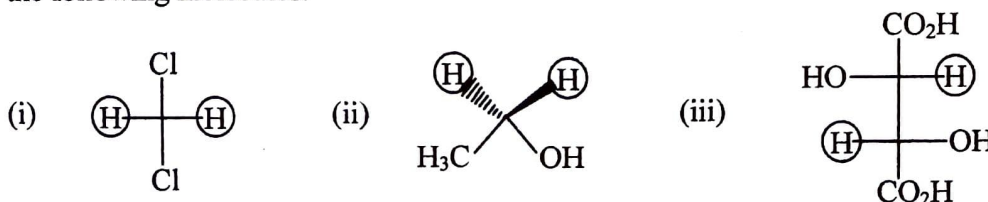
Unit-I

1. (a) Define the following terms with suitable example(s). 2×2=4  
 (i) Butressing effect (ii) Thorpe-Ingold effect.  
 (b) Define chiral (stereo) axis and illustrate it with suitable examples in allene and biphenyl system. 3  
 (c) Draw all possible stereoisomers of the compound [A] and write the relationship (enantiomer/diastereomer) among them. 3  

$$\text{CH}_3\text{CH}=\text{CH}-\text{CH}_2\text{CH}(\text{OH})\text{CH}_3$$
 (A)  
 (d) Indicate the topicity of the ligands and/or faces as directed for the following examples. 3  
 (i) *pro-S* and *pro-E* Hs of 1-butene (ii) *pro-S* H and Si face of butanone.
2. (a) Give the proper designation R/S of following spiro-compounds: 2



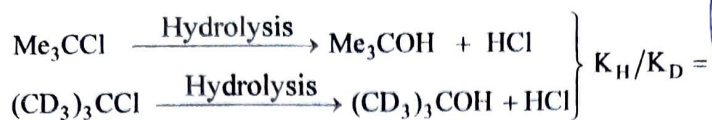
- (b) Draw the most populated conformer of the following molecules. Account for your choice. 3  
 (i) ethyl chloride (ii) 1, 2-dibromoethane (iii) ethylene glycol  
 (c) Identify the encircled hydrogens as homotopic, enantiotopic, or diastereotopic in the following molecules. 3







(d) Explain the following observations with proper mechanism and energy profile. 3

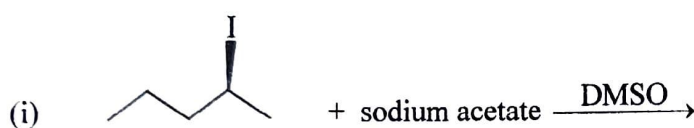


(e) What is valence tautomerism? Describe with an example. 2

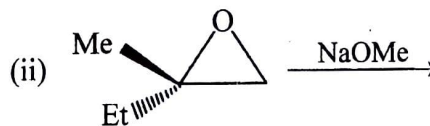
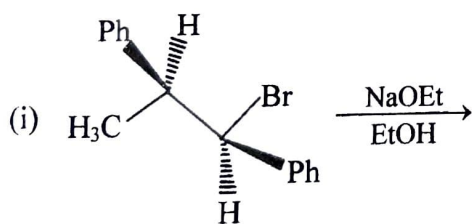
### Unit-III

5. (a) Account for the fact that allylic bromination of 1-hexene by NBS gives two products. Which one is major product and why? 2

(b) Write the expected substitution product(s) for each reaction and predict the mechanism by which each product is formed. 3

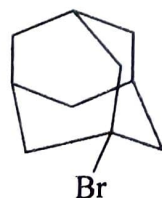


(c) Predict the product with proper configuration.  $1\frac{1}{2} \times 2 = 3$

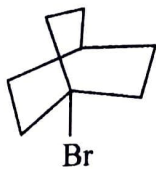


(d) Explain why Grignard reagent could not be formed from 1,2-dibromoethane. 2

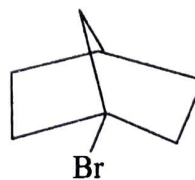
(e) The relative rates for solvolysis of the following compounds in 80% ethanol at room temperature are as follows: 3



rate(s): 1



$10^{-3}$



$10^{-10}$

How could you explain the observation?

6. (a) Consider the following statements in reference to  $S_N1$ ,  $S_N2$ , E1 and E2 reactions of haloalkanes. To which mechanism(s) if any, does each statement apply? 4
- (i) Involves inversion of configuration at the site of substitution.
  - (ii) Is greatly accelerated in protic solvents of increasing polarity.
  - (iii) Is first order in haloalkane and first order in base.
  - (iv) Order of reactivity of haloalkanes is  $3^\circ > 2^\circ > 1^\circ$ .
- (b) Which of the two substrates gives better yield of 1-alkene and why? 3
- (i)  $\text{MeCH}_2\text{CMe}_2 \xrightarrow{\quad\quad\quad} \quad\quad\quad$  OR (ii)  $\text{MeCH}_2\text{CMe}_2 \xrightarrow{\quad\quad\quad} \quad\quad\quad$
- $\begin{array}{c} | \\ \text{NMe}_3\text{I}^\oplus \\ \oplus \end{array}$   
[A]

$\begin{array}{c} | \\ \text{Br} \end{array}$   
[B]
- (c) Bromination is more selective than chlorination of 2-methylpropane: 2  
—Explain with reason.
- (d) Which one is more nucleophilic and why? [**any two**] 2
- (i)  $\text{RO}^-$  and  $\text{RCOO}^-$       (ii)  $\text{NH}_3$  and  $\text{H}_2\text{O}$       (iii)  $\text{NH}_3$  and  $\text{NH}_2\text{NH}_2$
- (e) Write a mechanism for the hydrolysis of the nitrogen mustard bis(2-chloroethyl) methylamine [ $\text{ClCH}_2\text{CH}_2\text{N}(\text{Me})\text{CH}_2\text{CH}_2\text{Cl}$ ]. 2

—x—