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MCH–012

MASTER OF SCIENCE IN CHEMISTRY/MASTER OF SCIENCE IN ANALYTICAL CHEMISTRY (MSCCHEM/MSCANCHEM)

Term-End Examination

December, 2024

MCH–012 : STEREOCHEMISTRY AND REACTIVE INTERMEDIATES

Time : 2 Hours *Maximum Marks : 50*

Note : *Attempt any* ***five*** *questions. All questions carry equal marks.*

1. (a) Briefly explain the term chirality giving a suitable example. Using an example, discuss how is chirality related to symmetry. 5

   (b) Write all the stereoisomers of 2, 3, 4-trihydroxypentanedioic acid. Give reasons for the absence or presence of optical activity in these stereoisomers. 5

2. (a) Name the rules that are followed to assign E or Z designation to the geometrical isomers. Draw the (E)-isomers of the following compounds : 5

(i) 3-Methyl hex-3-ene

(ii) 1-bromo-1-ethyl propene

and the (Z)-isomers of the following compounds :

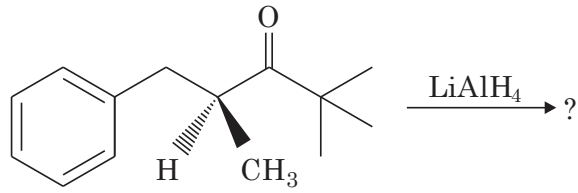
(iii) 1-bromo-2-methoxypropene

(iv) 1-chlorobut-2-ene

(b) List the factors leading to the distortion of ring structure of cycloalkanes. Draw the energy diagram depicting different conformations of cyclohexane. 5

3. (a) Compare the R/S and P/M designations of assigning configurations. Give an example to explain each of them. 5

(b) Write the major product formed in the following reaction. Which out of the Cram's and Felkin's rule is followed in product formation ? Explain : 5



4. (a) Briefly explain the chirooptical phenomenon, cotton effect. How does it help in determining the absolute configuration of (–)-trans-1-decalone ? 5

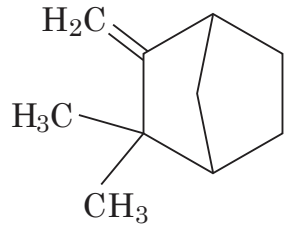
(b) Using suitable examples, describe the HSAB concept. Explain the nucleophilic addition reaction of α, β-unsaturated carbonyl compounds with Grignard reagent using this concept. 5

5. (a) Write the product obtained by the hydrolysis of 2-bromopropanoic acid with silver hydroxide. Write its mechanism and justify your answer. 5

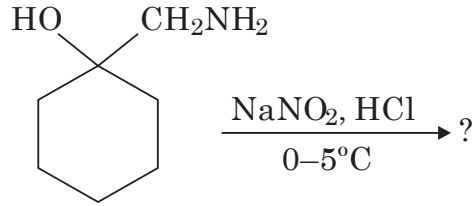
(b) What are ambident nucleophiles ? With the help of an example, explain the factors that affect their reactivity. 5

6. (a) Complete any *one* of the following reactions. Also write the types of reaction involved and the mechanism : 5

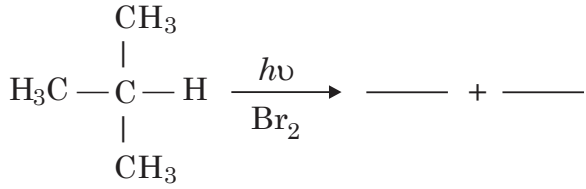
(i)



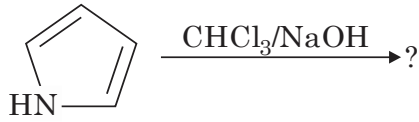
(ii)



(b) Compare the free radical chlorination and the free radical bromination in terms of the bond dissociation energies. Write the products formed indicating the major product in the following reaction. Give reason for your answer : 5



7. (a) How do nitrenes structurally resemble carbenes ? Complete the following reaction and write its mechanism : 5



(b) Describe the structures of the following : 5

(i) Nitrenes

(ii) Benzynes

× × × × × × ×