

**FIRST SEMESTER M.Sc. DEGREE EXAMINATION, NOVEMBER 2022**  
**(Regular/Improvement/Supplementary)**

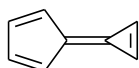
**CHEMISTRY**  
**FCHE1C03- STRUCTURE AND REACTIVITY OF ORGANIC COMPOUNDS**

Time: 3 Hours

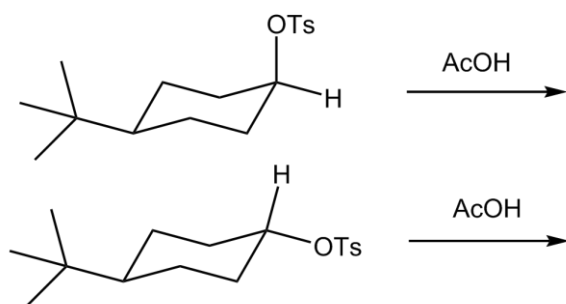
Maximum Weightage: 30

Section A: Short answer questions. Answer *any eight* questions. Each carries 1 weightage.

1. Cyclopentadiene is surprisingly acidic ( $pK_a$  ca. 16) and unlike cyclopentadiene, cycloheptatriene is not an acidic hydrocarbon; its  $pK_a$  is about 36. Justify your answer.
2. Give an account for the fact that the following fulvalene has very high dipole moment.



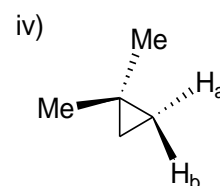
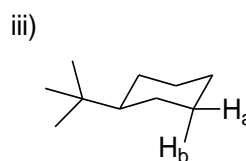
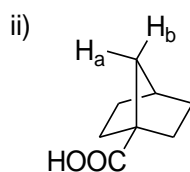
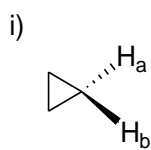
3. What is the significance of steric substituent constant?
4. Explain thermodynamic and kinetic control reaction by citing suitable example.
5. Predict the preferred conformation of *cis* and *trans-t*-butylcyclohexanol.
6. Define the term "Prochirality". Differentiate conceptually  $sp^2$  and  $sp^3$  prochiral carbons.
7. What are chiral auxiliaries? Give an example of one used in asymmetric Diels-Alder reactions.
8. Which of the following pair would react faster in  $S_N1$  hydrolysis reaction. Why?



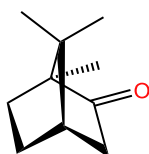
9. Write a short note on Helical Chirality.
10. Demonstrate how the chirality originate in nitrogen and sulfur containing compounds.

(P.T.O.)

11. Predict whether the marked hydrogens are homotopic, enantiotopic or diastereotopic.



12. Assign the stereochemical descriptors (R/S) of the stereogenic centers of the following compound.

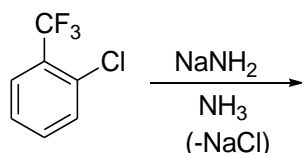


(8 x 1 = 8 weightage)

**Section B: Short essay questions. Answer any four questions. Each carries 3 weightage.**

13. Comment on aromaticity of [10] Annulene, [14] Annulene and [18] Annulene.

14. Identify the product and write the mechanism of the reaction.



15. Less stable conformer leads to the major product or less stable conformer reacts more quickly than the more stable conformer. Justify your answer by Curtin Hammett principle.

16. Discuss the Edward-Lemieux effect by citing suitable example

17. Explain the asymmetric reduction using BINAL-H, IPC<sub>2</sub>BH and IPCBH<sub>2</sub>.

18. Write a short note on the basic principle involved in resolution of racemates? Illustrate the application of *S*-brucine in resolution?

19. Draw all conformational isomers of 1,2- and 1,4-dimethylcyclohexane. Predict the chirality.

(4 x 3 = 12 weightage)

**Section C: Essay questions. Answer *any two* questions. Each carries 5 weightage.**

20. State and explain the Hammett equation. Illustrate with examples, how Hammett quantifies the effects of electron-donating or withdrawing groups on the transition state or intermediate during the course of a reaction.
21. Discuss the conformations of fused, bridged and caged ring systems.
22. a) Write stereochemistry of reduction by using CBS reagent with a suitable example.  
b) Discuss the concept of asymmetric induction and illustrate the prediction of stereochemical outcome with Felkin-Ahn model with a suitable example.
23. a) Predict the stereochemical outcome of pyrolytic elimination of cyclohexyl esters.  
b) Compare the esterification rate of menthol, isomenthol and neomenthol.

**(2 x 5 = 10 weightage)**