



K25U 0121

Reg. No. :

Name :

**Sixth Semester B.Sc. Degree (C.B.C.S.S. – OBE-Regular/Supplementary/
Improvement) Examination, April 2025
(2019 to 2022 Admissions)**

**CORE COURSE IN CHEMISTRY/POLYMER CHEMISTRY
6B16CHE/PCH : Physical Methods in Chemistry**

Time : 3 Hours

Max. Marks : 40

SECTION – A

Very short answer type. **Each** question carries **1** mark. Answer **all** 4 questions. (4×1=4)

1. Draw the structure of TMS. How many ^1H NMR signals it can give ?
2. What is an auxochrome ?
3. Define identity operation.
4. What is meant by Schonflies notation ? Give an example.

SECTION – B

Short answer type. **Each** question carries **2** marks. Answer **7** questions out of 10. (7×2=14)

5. Give the mathematical expression of rotational constant. Explain the terms.
6. Sketch the vibrational modes of water molecule.
7. State mutual exclusion rule. Illustrate with example.
8. What is meant by fingerprint region in IR spectroscopy ?
9. Define proper and improper axis of rotation.
10. Differentiate between top down and bottom up approach in nanomaterial synthesis.
11. Classify nanomaterials based on their dimensions.
12. What is ab-initio method ?
13. What are basis sets ?
14. Discuss the salient features of molecular mechanics method.

P.T.O.

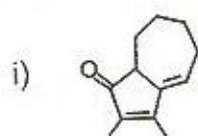
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SECTION – C

Short essay/problem type. **Each** question carries **3** marks. Answer 4 questions out of 6. (4×3=12)

15. Explain the principle behind the spectroscopic determination of the bond length of a diatomic molecule.
16. What are the applications of IR spectroscopy ?
17. Derive the Beer Lambert law.
18. Explain the spin spin splitting.
19. Calculate the absorption maxima for the following molecules.



20. Determine the point groups in i) H_2O and ii) NH_3 . List the symmetry elements present in them.

SECTION – D

Long essay type. **Each** question carries **5** marks. Answer **2** questions out of 4. (2×5=10)

21. i) Derive the expression for the rotational constant of a rigid diatomic molecule.
ii) Briefly explain the origin of Raman spectroscopy.
22. What is chemical shift ? Explain the scales of expressing chemical shift. Briefly discuss about the factors affecting chemical shift.
23. Sketch and explain the ^1H NMR spectra of i) Acetophenone and ii) Acetaldehyde.
24. Briefly explain about i) SEM and ii) TEM techniques.