

Reg. No. :

Name :

**VI Semester B.Sc. Degree (CBCSS-OBE – Regular/Supplementary/
Improvement) Examination, April 2023
(2019 and 2020 Admissions)**

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

Time : 3 Hours

Max. Marks : 40

SECTION – A

Answer **all** questions. **Each** question carries **1** mark :

1. Among CO, HCl and O₂, that which will not yield a microwave spectrum is _____
2. How many normal modes of vibrations does water molecule have ?
3. Define a hypsochromic shift.
4. The number of elements in a finite group is called _____ (4×1=4)

SECTION – B

Answer **seven** questions out of **10**. **Each** carries **2** marks :

5. State Born-Oppenheimer approximation.
6. What are hot bands in a vibrational spectrum ?
7. State Franck-Condon principle.
8. Predict the number of signals in the PMR spectra of acetaldehyde and toluene.
9. Distinguish between vertical and dihedral mirror planes.
10. Name the elements of the C_{3v} point group.
11. Mention the classification of nanomaterials on the basis of dimensionality.

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12. What are quantum dots ? Give an example.
13. How will you distinguish three isomeric butanols on the basis of mass spectrometry ?
14. List out the main features of Ab initio methods. (7×2=14)

SECTION – C

Answer **four** questions out of **6**. **Each** carries **3** marks :

15. Explain Mc Lafferty rearrangement with illustrative examples.
16. Distinguish between chromophores and auxochromes with suitable examples.
17. Stokes lines are found to be more intense than antistokes lines. Why ?
18. Explain the term shielding and deshielding with regard to NMR spectroscopy.
19. Give the principle and applications of scanning electron microscopy.
20. Write a short note on semiempirical methods. (4×3=12)

SECTION – D

Answer **two** questions out of **4**. **Each** carries **5** marks :

21. Discuss the quantum theory of Raman effect.
22. a) Write a short note on synthesis and applications of carbon nanotubes.
b) Explain briefly the basic principle of NMR spectroscopy.
23. a) Identify the symmetry elements present in H₂O, NH₃ and assign their point groups.
b) Explain the Woodward-Fieser rules for the determination of λ_{max} of dienes.
24. a) Explain how rotational spectroscopy can be used to calculate the bond length in diatomic molecules.
b) Distinguish between fundamental bands and overtones in vibrational spectra. (2×5=10)