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Reg. No. : .....

Name : .....

Fourth Semester B.Sc. Degree Examination, July 2023

First Degree Programme under CBCSS

Chemistry

Complementary Course for Physics

CH 1431.1 : SPECTROSCOPY AND ADVANCED MATERIALS

(2020 Admission onwards)

Time : 3 Hours

Max. Marks : 80

SECTION – A

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

1. Which region of electromagnetic spectrum is used to do NMR spectroscopy?
2. Which of the following molecule will show microwave spectrum: H_2, N_2, H_20, CO_2
3. What is meant by super conductivity?
4. Mention any two units of dosimetry.
5. Which type of magnetism is exhibited by $K_4[Fe\ (CN)_6]$.
6. What is the selection rule for vibrational spectrum?
7. What are the nuclear spin energy levels of deuterium atom?

P.T.O.

8. Mention one optical property exhibited by nano materials.

9. What is the condition for a molecule to show Raman spectrum?

10. Mention one application of liquid crystal.

(10 × 1 = 10 Marks)

SECTION – B

Answer any **eight** questions. **Each** question carries **2** marks.

11. What is Werner's co-ordination theory?

12. Write down the expression for frequency and energy vibrations and explain the terms.

13. What is a rigid rotor?

14. How mutual exclusion principle is used in structure determination?

15. What is Raleigh scattering and Raman scattering?

16. Comment on the mechanical properties of Nanomaterials.

17. What are high spin complexes?

18. How does spin-spin arise in NMR spectroscopy?

19. Explain piezoelectricity.

20. What is top-down and bottom-up approach for nano material synthesis?

21. What is STM and its basic principle?

22. Explain the synthesis of polyaniline from aniline?

(8 × 2 = 16 Marks)

SECTION – C

Answer any **six** questions. **Each** question carries **4** marks.

23. Taking HC1 as example, show how the dipole moment fluctuates as the molecule undergoes rotation?

24. Explain Franck-Condon principle?

25. Why are stock lines more intense than anti stock lines in Raman spectroscopy?

26. Explain the crystal field theory of bonding in octahedral complexes.

27. Briefly explain the ceric sulphate dosimetry.

28. Explain the properties of Nano materials.

29. Explain the principle and application of AFM.

30. Discuss the synthesis and application of poly acetylene.

31. Explain how nano materials are used in medicine.

(6 × 4 = 24 Marks)

SECTION – D

Answer any **two** questions. **Each** question carries **15** marks.

32. (a) Briefly explain the metallurgy of Uranium.

    (b) Give a brief account of the application of nano particles semiconductors.

33. (a) Explain the principle of Raman spectroscopy.

    (b) Explain the different types of transitions and the regions where they absorb in electronic spectroscopy?

34. (a) Discuss the different classification of liquid crystal and its application.

(b) Give a briefing on biodegradable Polymers.

35. (a) Briefly explain rock dating.

(b) Explain the formation of high spin and low spin complexes using crystal field theory.

(2 × 15 = 30 Marks)
