

Reg. No. :

Name :

Fourth Semester B.Sc. Degree Examination, August 2022

First Degree Programme under CBCSS

Chemistry

Complementary Course for Physics

CH 1431.1 : SPECTROSCOPY AND MATERIAL CHEMISTRY

(2019 Admission)

Time : 3 Hours

Max. Marks : 80

PART - A

Answer all questions :

1. Which region of electromagnetic spectrum possess lowest chemistry?
2. Rotational spectroscopy is also known as?
3. Write the molecular formula of TMS.
4. Which radiation is commonly used for irradiation in Raman spectroscopic arrangements?
5. Give an example of a Chelating ligand.
6. What is the IUPAC name for $K_4 [Fe(CN)_6]$?
7. What is the chemical form of rutile ore?
8. Give an example of nanomaterial that was used in ancient time.

9. Suggest any example for scanning probe instruments used for nanoparticle characterization.
10. A state of matter intermediate between liquid and solid is known as.

(10 × 1 = 10 Marks)

PART – B

Answer any eight questions.

11. Mention the selection rules for microwave spectra.
12. Explain force constant. What is the unit of force constant.
13. Calculate the wavelength of the matter-wave associated with a particle of mass 10g moving with a velocity 10 ms^{-1} .
14. What are the applications and advantages of Raman spectroscopy over IR spectroscopy?
15. Explain the complementary nature of Raman and IR spectra with respect to vibrational modes of water.
16. Which region of the electromagnetic spectrum is used for NMR spectroscopy? Why?
17. Describe EAN.
18. Write the structure of Pentaamminecarbonatocobalt(III) chloride and Pentaamminechloro cobalt(III)chloride.
19. What is ligand denticity and types of ligands?
20. Define Pyrometallurgy.
21. Suggest any two important ores of Titanium and Thorium.
22. Write a short note on optical properties of nanoparticle.
23. Mention electronics and computer applications of nanoparticles.

24. What happens to the mechanical properties when a bulk particle is converted into nano scale?
25. What is the classification of conducting polymers?
26. What are liquid crystals?

(8 × 2 = 16 Marks)

PART – C

Answer any six questions.

27. Explain the Selection rule of IR spectroscopy and its applications.
28. Discuss microwave spectroscopy. Give its applications.
29. Discuss the splitting of NMR signals and spin-spin coupling.
30. What is the quantum mechanical concept of Raman effect?
31. Explain the magnetic properties of $[\text{Fe}(\text{CN})_6]^{3-}$ and $[\text{Fe}(\text{CN})_6]^{4-}$ based on VBT.
32. Mention the features of Werner's theory and its limitations.
33. Write the different methods involved in the metallurgy of Nickel.
34. Mention different methods involved in the refining of metals.
35. Write briefly about SEM in the characterization nanoparticles.
36. Briefly discuss the different applications of nanomaterials.
37. What are photoconducting polymers and conducting polymers
38. Write a short note on polyacetylene and polyaniline.

(6 × 4 = 24 Marks)

PART – D

Answer **any two** questions.

39. Explain chemical shift with respect to shielding and deshielding effects in NMR spectroscopy.
40. Write a note on Microwave and IR spectroscopy with suitable examples.
41. Describe the different theories used in explaining the structure and bonding in coordination complexes.
42. Explain the various steps involved in metallurgical processes.
43. Briefly explain different microscopic instruments used for analyzing nanostructure.
44. Explain sonic advanced materials and their applications.

(2 × 15 = 30 Marks)