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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

(2017 – 2018 Admission)

Time : 3 Hours Max. Marks : 80

SECTION – A

Answer **all** questions.

1. Name two important ores of Nickel.
2. What are ferrimagnetic materials?
3. The central atom/ion of a coordination complex is also referred to as Lewis acid. Why?
4. For milling operations, what kind of environment is preferred? Why?
5. Define sol-gel process.
6. Helium gas serves as buffer gas in Laser ablation. Why?
7. What is dissociation energy?
8. What is a chromophore?
9. How many orientations take place when a proton is placed in a magnetic field?
10. Define the term chemical shift.

(10 × 1 = 10 Marks)

P.T.O.

SECTION – B

Answer **any eight** questions.

11. Briefly discuss about van-Arkel method.

12. Give the classification of liquid crystals. Give any two applications of liquid crystals.

13. What are high spin complexes?

14. Explain the role of top down approaches in nanotechnology.

15. List any four applications of nanotechnology.

16. What is AFM?

17. What are stretching and bending modes of vibrations?

18. Calculate the reduced mass of HCl [At. mass of H = 1.008 amu; Cl = 35.45 amu]

19. Sketch the vibrational modes of H_2O.

20. Why Raman and IR spectroscopy are complementary to each other?

21. Write a note on different types of electronic transitions.

22. Explain the terms shielding and deshielding with regard to NMR spectroscopy.

(8 × 2 = 16 Marks)

SECTION – C

Answer **any six** questions.

23. Discuss the principle of zone refining.

24. Write a short note on super conducting materials.

25. Describe Werner's coordination theory.

26. Explain sol-gel synthesis for producing nanomaterials.

27. Discuss the optical properties of nanomaterials.

28. Write a note on the applications of nanomaterials in electronics.

29. The microwave spectrum of HF, the lines are 41.9 cm^{-1} apart. Calculate the moment of inertia and bond length in HF [H = 1.008 amu; F = 19.0 amu]

30. Given that the force constant for the carbon-oxygen bond in CO is at 1850.64 Nm^{-1}, calculate the fundamental vibrational frequency in cm^{-1}. [H = 1.008 amu; Cl = 35.4 amu].

31. Explain the term Larmor precession and based on the concept, explain nuclear magnetic resonance.

(6 × 4 = 24 Marks)

SECTION – D

Answer **any two** questions.

32. Discuss the metallurgy of titanium and uranium.

33. What are conducting polymers? Discuss the synthesis, properties and applications of

    (a) poly acetylene and

    (b) poly anilines.

34. Discuss the valence bond theory of octahedral and tetrahedral complexes.

35. Derive the relationship between the vibrational energy and frequency of oscillation of a simple harmonic oscillator model.

(2 × 15 = 30 Marks)
