

17. (a) Explain how DEPT experiment is useful in structure elucidation.
(b) Discuss the study of fluxional behaviour of molecules using NMR. (8+7)
18. (a) How will you differentiate cis and trans isomers using UV-visible spectroscopy?
(b) What are the selection rules for electronic transitions in co-ordination complexes? (7+8)
19. (a) Discuss the ESR spectra of Mn(II) complexes.
(b) What are the advantages of CD over ORD? (9+6)
20. (a) Discuss the general fragmentation modes in mass spectroscopy.
(b) What are screw axis and glide plane. (9+6)
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S.No. 7403

PN 15 CH 6

(For candidates admitted from 2015–2016 onwards)

M.Sc. DEGREE EXAMINATION, NOVEMBER 2023.

Chemistry

PHYSICAL METHODS IN CHEMISTRY

Time : Three hours

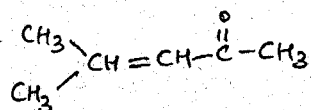
Maximum : 100 marks

PART A — (10 × 2 = 20)

Answer ALL questions.

1. How is the rotational constant (in cm^{-1}) in microwave spectroscopy related to moment of inertia?
2. How many bands are observed for H_2O in its IR spectrum?
3. What is coupling constant?
4. What is the effect of quadrupole moments in NMR?

5. Calculate $\lambda_{\max}$ for



6. What is the ground term for V^{3+} (d^2) and Cu^{2+} (d^9) transition metal ions?
7. Predict the number of lines in the ESR spectra of
- (a) $\dot{\text{C}}\text{H}_3$ (b) C_6H_6^-
8. Compare ORD and CD.
9. What is isomer shift in Mossbauer Spectroscopy?
10. What are the importance factors responsible for causing neutron diffraction?

PART B — ($5 \times 7 = 35$)

Answer ALL questions, choosing either (a) or (b).

11. (a) How will you distinguish intermolecular and intramolecular hydrogen bonding using IR spectroscopy?
- Or
- (b) Discuss the simple harmonic oscillator model of a vibrating diatomic molecule.

12. (a) What are shift reagents? What is their role in NMR spectroscopy?

Or

- (b) What is Nuclear Overhauser Effect?
13. (a) Discuss the effect of steric hindrance in UV-visible spectroscopy.

Or

- (b) What are the factors affecting D_q and β ?
14. (a) What is zero field splitting?

Or

- (b) State and explain octant rule.
15. (a) Discuss the applications of Mossbauer spectroscopy to iron compounds.

Or

- (b) What is the importance of metastable peaks?

PART C — ($3 \times 15 = 45$)

Answer any THREE questions.

16. (a) Discuss the rotational spectra of non-rigid diatomic molecule.
- (b) What are the factors influencing the group frequencies in IR spectrum? (10+5)