



Ran-1803080201010001

M.Sc. (Sem. I) Examination November - 2025

Chemistry : Inorganic Chemistry Paper - 1

[Total Marks: 70]

સૂચના : / Instructions (1) ઉપરોક્ત દર્શાવેલ વિગતો ઉત્તરવહી પર અવશ્ય લખવી. Fill up strictly the above details on your answer book (2) Attempt all the questions (3) Figures to the right indicate full marks of the question (4) Sketch neat and labelled diagram wherever necessary	Seat No.: <table border="1"> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </table> Student's Signature						

Q. 1 Answer briefly any three of the following. [18]

- State and explain orthogonality theorem and discuss its important consequences.
- What is character of a matrix ? Derive matrix for the rotation operation in anticlockwise direction.
- What is character table? Construct the character table for C_{3v} point group.
- Explain hybridisation of Sigma bond in BCl_3 and CH_4 molecules.

Q.2 Answer briefly any three of the following. [18]

- Define operator and give its significance in quantum chemistry.
- What is linear harmonic oscillator ? Show the total energy of the oscillator in one dimensional oscillation is $E = \frac{1}{2} KA^2$.
- Explain spin orbit coupling and Zeeman's effect.
- What is an angular momentum ? Give operators for components of angular momentum in terms of r and p .

Q. 3 Answer briefly any three of the following. [18]

- What is base hydrolysis ? Discuss base hydrolysis with suitable examples.
- Differentiate lability and thermodynamic stability of complexes giving suitable examples.
- What is acid hydrolysis ? Explain factor affecting on acid hydrolysis.
- Explain labile and inert complexes on the basis of VBT.

Q. 4 Answer briefly any three of the following. [16]

- Describe the structure of trinuclear and tetranuclear halide type metal clusters, including suitable diagrams.
- Discuss the synthesis of high nuclearity carbonyl clusters (HNCC) and low nuclearity carbonyl clusters (LNCC) with examples.
- Discuss in detail about the structures and bonding of Hexaborane-10.
- Discuss Zintl ions. Give at least three examples and give their proper structure.