10. (a) Explain the use of group vibrations in the structural elucidation of metal complexes of urea, nitrate and sulphate. (10)

Or

(b) (i) Describe the group theoretical treatment for C_2V molecules. (5)

(ii) Write the limitations of IR. (5)

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SECTION A — ($5 \times 5 = 25$ marks)

Answer ALL questions.

1. (a) Write the preparation, properties and structure of boron hydrides.

Or

(b) Define carboranes. How is rido carborane prepared?

2. (a) Discuss the principles of PES.

Or

(b) Explain the photo redox reactions with suitable examples.

3. (a) Define
   (i) Term symbols (2½)
   (ii) Hund's rule. (2 ½)

   Or

   (b) Discuss the spectral properties of lanthanides.

4. (a) Describe the principle of polarography.

   Or

   (b) What do you understand by masking and demasking agents?

5. (a) How is the structure of N_2O determined by IR and Raman spectroscopy?

   Or

   (b) Explain the effect of substitution on vibration spectroscopy of molecules.

   SECTION B — (5 × 10 = 50 marks)

   Answer ALL questions.

6. (a) Explain the preparation, properties and structure of diborane. (10)

   Or

   (b) (i) Write a short note on metal clusters. (5)

   (ii) Discuss the structure of Re_2Cl_8. (5)

7. (a) Draw and explain the PES of CO and HCl. (5+5)

   Or

   (b) Discuss the applications of metal complexes in solar energy conversion. (10)

8. (a) Draw and explain Orgel diagram of d' configuration in octahedral and tetrahedral complexes. (10)

   Or

   (b) Explain
   (i) Charge transfer spectra. (5+5)
   (ii) Spin orbit coupling.

9. (a) Discuss the types of titration curves in amperometric titration. Write the applications of it. (10)

   Or

   (b) How do diffusion and kinetic current affect the limiting current in polarography? Write the qualitative and quantitative applications of it. (10)