This question paper contains 2 printed pages. Roll No. ....

5621

M.Sc. (Previous) Examination – 2024

CHEMISTRY

Paper-I-CH-401

(Inorganic Chemistry)

Time Allowed: Three Hours **Maximum Marks: 100**

Attempt any five questions in all, selecting one question from each unit. All questions carry equal marks.

Note – In each question paper 10 questions will be set. Candidates have to answer 5 questions selecting atleast one question from each unit.

No supplementary answer-book will be given to any candidate. Hence the candidates should write their answers precisely in the main answer-book only.

All the parts of one question should be answered at one place in the answer-book. One complete question should not be answered at different places in the answer-book.

Unit-I

1. (a) Define symmetry elements and symmetry operations with suitable complex. **[10]**

   (b) State the important rules about irreducible representation. **[10]**

OR

2. (a) What is character table? Draw a character table for C_{2v} point groups. **[10]**

   (b) Determine the symmetry point group of the following molecules - **[10]**

   (i) H_2O (ii) NH_3 (iii) CO_2 (iv) BF_3

Unit-II

3. (a) Explain the composite ligand orbitals for σ-bonding in the case of octahedral complexes. **[10]**

   (b) What is Crystal Field Stabilization Energy (CFSE)? Calculate CFSE for high spin d^4, d^5 and low spin d^7, d^8. **[10]**

OR

4. How many types of bonds are involved in the bonding of boranes? **[10+10=20]**

   (i) B_4H_{10} (ii) B_5H_9 (iii) B_5H_{11} (iv) B_6H_{11} (v) $B_{10}H_{14}$

   What is styx number? Write the styx number for above boranes.

Unit-III

5. (a) Draw an orgel diagram and explain the spectrum of $[COF_6]^{-3}$ which occurs as a broad and split band in the visible region. [10]

(b) Explain the charge transfer spectra. [10]

OR

6. (a) Discuss the electronic spectra OR what are the important selection rules for the electronic spectra of metal complexes. [10]

(b) Explain Laporte's rule may strictly apply in certain causes permitting some d-d transition. [10]

Unit-IV

7. What do you mean by labile complexes and inert complexes? Explain. [20]

OR

8. (a) Explain the acid hydrolysis of an octahedral complexes. [10]

(b) Explain the SN^1 (CB) mechanism of base hydrolysis and at very high concentration of $O\overline{H}$ ions its rate is independent of $(O\overline{H})$. [10]

Unit-V

9. (a) What is the order of radioactive disintegration process? Derive the relationship between half-life and decay constant. [10]

(b) Briefly explain the construction and working of a nuclear reactor. [10]

OR

10. (a) What is Geiger-Nuttall rule and neutron activation analysis? [10]

(b) What is meant by the binding energy of the nucleus? How is it related to mass defect? [10]
