



61901

Reg. No.

--	--	--	--	--	--	--	--	--	--

I Semester M.Sc. Degree Examination March/April - 2025

CHEMISTRY

Inorganic Chemistry - I

Paper : Ch-101

(CBCS 2019-20 Scheme)



Time : 3 Hours

Maximum Marks : 70

Instructions to Candidates:

Answer question No. 1 and any FIVE of the remaining questions.

1. Answer any TEN of the following.

(10×2=20)

- State the Bent's rule with an example.
 - Write the structure of CaF_2 and indicate the coordination number of Ca^{2+} and F in it.
 - Bond dissociation energies of H_2 , Br_2 and HBr are 432, 190 and 362 kJ mol^{-1} respectively. Calculate the electronegativity values.
 - Draw the topological structure of B_5H_9 and find its styx code.
 - Give the preparation and structure of $[\text{Fe}(\text{C}_2\text{B}_9\text{H}_{11})_2]^{2-}$.
 - Draw the structures and mention the composition of benitoite and beryl.
 - Give the applications of heteropoly acids.
 - In what way N_2O_4 auto ionizes? How do as NaNO_3 act in it?
 - Give the meaning of symbiosis with an example.
 - Define the terms: isotopes, isobars, isotones and isomers.
 - Calculate the binding energy per nucleon for ${}_{27}\text{Co}^{59}$ with a mass of 58.95182 amu. (Mass of H atom = 1.008142 amu and neutron is 1.008982 amu).
 - Enumerate the factors that favor metal-metal bonding.
2. a) Give the rules of LCAO for formation of molecular orbitals. Draw the MO energy level diagram of ICl .
- Derive the limiting radius ratio for octahedral arrangement.
 - Depict the compound which is more covalent. Give reason for your choice
 - AgCl and AgI
 - NaCl and KCl
 - SnCl_2 and SnCl_4

(4+3+3)

[P.T.O.]





(2)

61901

3. a) Discuss the synthesis, structure and bonding in borazine. Why is it called inorganic benzene?
b) Why do zeolites exhibit molecular sieving property? Explain with examples.
c) What are carboranes? How are these classified? Give one example for each class. (4+3+3)
4. a) Describe the measurement of absolute configuration of complexes using CD with suitable examples.
b) Discuss the theoretical basis of HSAB concept. On the basis of this concept, identify the unstable complex ions in the following pairs of compounds. (4+6)
i) AgF_2^- and AgI_2^-
ii) $[\text{Co}(\text{NH}_3)_5\text{I}]^{2+}$ and $[\text{Co}(\text{NH}_3)_5\text{F}]^{2+}$
iii) $[\text{Co}(\text{CN})_5\text{F}]^{3-}$ and $[\text{Co}(\text{CN})_5\text{I}]^{3-}$
5. a) Explain the structure and bonding involved in $[\text{Re}_2\text{Cl}_8]^{2-}$
b) Describe the salient features of shell model for nuclei. (5+5).
6. a) Write Kapustinskii's equation and define the terms in it. Using this equation calculate the lattice energy of KNO_3 . (Given radius of $\text{K}^+ = 1.38\text{\AA}$ radius of $\text{NO}_3^- = 1.89\text{\AA}$)
b) On the basis of VSEPR theory, explain the shapes of XeF_8^{2-} , IF_7 and TeF_5^- . What are its limitations.
c) What is isomorphous replacement with respect to silicates? Explain with an example. (3+4+3)
7. a) How are S_4N_4 and S_2N_2 prepared? Explain the structure and bonding in S_4N_4 .
b) Explain the preparation, bonding and structure of $(\text{PNCl}_2)_3$
c) Give examples of any three isopolymolybdate ions. At what pH, these are stable? (3+4+3)
8. a) Explain Cotton effect with an example.
b) Distinguish between low nuclearity and high nuclearity carbonyl clusters.
c) Which one of $^{206}_{82}\text{Pb}$, $^{207}_{82}\text{Pb}$ and $^{208}_{82}\text{Pb}$ is the most stablest nuclide? Justify your choice. (3+4+3)

