Chemistry (P.G.)
[CBCS]
M.Sc. First Semester End Examination-2023
(Regular & Supplementary Paper)
PAPER-CEM-103

Full Marks: 40 ***Time: 02 Hrs***

The figures in the right-hand margin indicate marks.
Candidates are required to give their answers in their own words as far as practicable.
Illustrate the answers wherever necessary.

Group-A

1. Answer **any four** questions 2 ×4

i) Differentiate between reducible and irreducible representation.

ii) What are the significance of globin protein in hemoglobin?

iii) Elaborate on Ewald sphere construction.

iv) Differentiate primitive and non-primitive unit cells.

v) Prove that if A is conjugated with B and C separately, then B and C are also conjugate with each other.

vi) What causes Wilson disease and Alzhimer's disease?

vii) What is the origin of cooperativity during oxygen binding to hemoglobin?

viii) Schottky defect occurs mainly in ionic lattices while Frenkel defect is predominant in covalent lattice system – explain.

Group-B

2. Answer **any four** from the following questions 8 ×4

i) a) Name two Zn containing enzymes. Outline mechanism of action one of them.

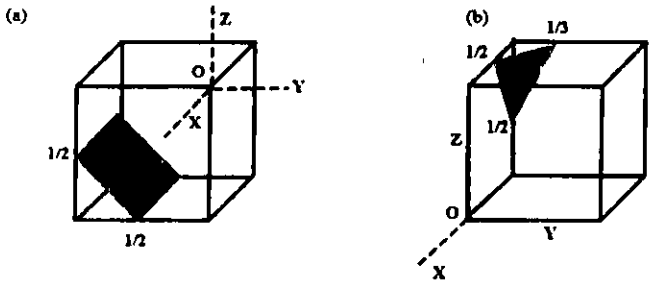
b) Draw structures of Fe-S proteins? How they behave in presence of acid? 4+4

ii) a) Find the point group of the following molecules/ions $B_3N_3H_6$, allene, open book structure of H_2O_2, eclipse ferrocene, N_2O, CO_3^{2-}

b) Derive the matrix form of $S_n(x)$ symmetry element. 3+5

iii) a) What are the (i) Miller indices of the planes shown in following unit cells? (ii) Determine their interplanar spacing. Given that lattice constant, a = 0.25 nm.

[Numbers shown in figure represent intercepts of the planes in terms of lattice parameters. x,y, and z represent crystallographic axes.]



b) State the properties of reciprocal lattice. How is a reciprocal lattice constructed from a direct lattice? 4 + 4

iv) a) What is the significance of Hill coefficient? How J P Collman designed 'artificial blood' in laboratory?

b) What is chelation therapy? Give a suitable example. 4+4

v) a) What do you mean by 'subgroup'? Write the conditions which must obey to form 'subgroup' Determine the sub-groups of D_{4h} and C_{4h}.

b) Verify that if there are two fold axes at right angles to one another, there must necessary be a third at right angles to both. 5 + 3

vi) a) Stoichiometric NiO is an insulator. However dopping it with a small amount of Li_2O changes its electric property. Explain.

b) Give any two differences between extrinsic and intrinsic semiconductors.

c) The monoxides of the early 3d-metals are the conductors while the monoxides of the late members of the series are the semiconductors. Justify the statement 2+3+3

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