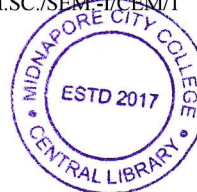


PG (CBCS)
M.Sc. Semester-I Examination, 2022
CHEMISTRY
PAPER: CEM 103
(INORGANIC CHEMISTRY-I)



Full Marks: 40

Time: 2 Hours

GROUP - A

1. Answer any **FOUR** questions from the following questions: 2×4 = 8
- What are the symmetry criteria for a molecule to be optically active?
 - The color of ZnO changes from white to yellow when heated in air.- Explain.
 - How Bohr's effect helps the functioning of haemoglobin?
 - Prove $S_2=i$ with the help of corresponding matrices.
 - Comment on the magnetic behavior of oxy-haemoglobin and de-oxy haemoglobin.
 - Construct the 'Group Multiplication Table' for H_2O molecule.
 - What is Reciprocal lattice?
 - What are the structural features of carbonic anhydrase enzyme?

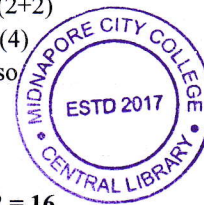
GROUP - B

2. Answer any **FOUR** questions from the following questions: 4×4 = 16
- (i) Find out the inversion operation of S_n^m operation when
(I) n is even and m is odd
(II) n is odd and m is even
(ii) Write down the 'Hermann-Mauguin notation' for the following point groups: D_2 and D_{3h} (2+2)
 - (i) What are the essential criteria for a collection of entities must have to form a group?
(ii) What do you meant by 'Abelian group'? Give an example. (2+2)
 - (i) Assign the point group to the following molecules and ions:
(I) ClF_3 ; (II) B_2H_6 ; (III) $cis-[Co(en)_2Cl_2]^+$, (IV) $Be(C_2O_4)_2^{2-}$
(ii) Work out the product of the following elements in C_{3v} point group.
 σ_v, C_3, σ_v and $\sigma_v, C_3^2, \sigma_v$ (2+2)
 - (i) Explain the binding mechanism of hemoglobin to O_2 .
(ii) Define Screw axis. (3+1)
 - Discuss 4Fe-ferredoxin with respect to structure, electron transfer and mechanism of action.

P.T.O.

(2)

- f) (i) Discuss the active site structure of Cytochrome P₄₅₀.
(ii) Explain the origin of red color in blood from the spectroscopy point of view. (2+2)
- g) Derive the matrix representation of vertical planes in NH₃ molecule. (4)
- h) Prove that if X is conjugate with Y and Z then X and Y are also conjugate with each other.

**GROUP - C**

3. Answer any **TWO** questions from the following questions: **8×2 = 16**

- a) (i) Derive Bragg's expression in terms of reciprocal lattice.
(ii) For an orthorhombic lattice the three sides are 10Å, 12Å and 15Å respectively. The number of lattice point per unit cell is 4. The molar mass of this species is 600g. Then what will be the density of that lattice? (4+4)
- b) (i) What is Hall Effect? How will you identify whether a semiconductor is n-type or p-type?
(ii) Derive the matrix form of C_n(z) symmetry element.
(iii) State the meaning and draw stereographic projections of the following point groups. 4 mm (2+5+1)
- c) (i) Write down the chemical reactions occur during ferritin mineralization.
(ii) Discuss the dioxygen binding mechanism in hemerythrin. (4+4)
- d) Derive the expression for equilibrium concentration of Schottky defects.
