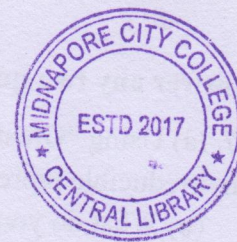Total page: 2

PG (NEW) CBCS
M.Sc. Semester-I Examination, 2018
CHEMISTRY
PAPER: CEM-103

(INORGANIC CHEMISTRY-I)

Full Marks: 40   **Time: 2 Hours**

Group- A

Answer any four questions: 2×4

1. Construct the group multiplication table for H_2O molecule.
2. Show that S_2 axis of symmetry is equivalent to center of symmetry (i).
3. What is glide plane? Explain
4. What is Meissner effect? Explain
5. Draw the active site structure of oxygenated form of hemerythrin.
6. Cite one model complex of hemerythrin.
7. Briefly describe the cause and effect of Willson's disease.
8. What do you mean by reciprocal lattice?

Group-B

Answer any four questions: 4×4

9. For the H_2O molecule show that each of the symmetry operation belongs to a different class. What is the point group of H_2O molecule?   3+1

10. (a) 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
    (b) Write down the 'Hermann-Mauguin notation' for the following point groups:
C_{3v}, D_{3h}.   2+2

11. (a) Derive the matrix form of $C_n(x)$ symmetry element.
(b) Identify the point group for each of the following molecules and ion:
    (i) $XeOF_4$
    (ii) $[Cr(OX)_3]^{3-}$ 3+1

12. (a) What is hall effect? How will you identify whether a semiconductor is n-type or p-type?
    (b) The colour of Zinc oxide changes from white to yellow when heated in air. Explain.
                                                                              2+2

13. Explain why a crystal cannot have C_5 axis of symmetry.   4

14. (a) Explain the origin of red colour in blood from spectroscopic point of view.
(b) Comment on the magnetic behavior of de-oxy and oxy-haemoglobin.   2+2

15. (a) Schematically present the iron storage in ferritin.
    (b) What is the structural feature of carbonic anhydrase enzyme?   2+2

16. (a) Explain the preferential binding of myoglobin to deoxygen in combination to carbon monoxide.
(b) Explain the change of geometrical transformation during the functioning of trigger mechanism in heamoglobin/myoglobin.   2+2

(Turn Over)

Group-C

Answer any two questions: 8×2

17. (a) Using "Great orthogonality theory" prove that sum of the square of the characters in anyirreducible representation equal to the order of the group.

(b) What do you mean of subgroup of a group? Find out the subgroup present in the group D_{3h}.   2+3+3

(c) Derive the matrix form of $S_n(x)$ symmetry element.

18. (a) Derive the expression of equilibrium concentration of Schottky defect.

(b) At what temperature does the first vacancy become stable in copper crystal?

Given: Number of atoms in the crystal $= N_A$

ΔH_f (Cu) = 1.24eV/vacancy

$k_B = 8.62 \times 10^{-5}$ eV/K   4+2+2

(c) What is screw axis? Explain.

19. (a) Discuss 4Fe-ferredoxin with respect to structure electron transfer and mechanism.

(b) Discuss the roll of distal and proximal histidine residues in haemoglobin and myoglobin.   4+4

20. (a) Calculate the glancing angel on the cubic face (100) of a rock salt crystal (a = 2.814 Å) corresponding to second order reflection of X-ray of wavelength 0.71 Å.

(b) Write short note on Miller Indices.

(c) State the meaning and draw stereographic projection of following point group.

   (i) mmm

   (ii) 2223+2+3

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