2016

M.Sc. 1st Semester Examination

CHEMISTRY

PAPER—CEM-103

Full Marks : 40

Time : 2 Hours

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

(*Inorganic Chemistry*)

Answer any *four* questions
taking *two* questions from each group.

Group—A

Answer any *two* questions.

1. (a) Discuss the types of crystal lattice according to the number of lattice point per unit cell. 3

(b) Calculate the wavelength of X-Ray if lattice constant of a crystal d = 2.8×10^{-10} metre and 1st order glancing angle is 12°. 3

(c) Write short notes on the following :

(i) Glyde plane ;

(ii) Miller indices. 2+2

2. (a) Calculate the galancing angle on the cube face (100) of a rock salt crystal (a = 2.814Å) corresponding to second order reflection of X-Rays of wavelength 0.710Å. 4

(b) State the meaning and draw stereographic protections of the following point groups :

(i) mmm

(ii) $4/mm^m$

(iii) $\bar{6}m2$

(iv) $\bar{4}2m$ $1\frac{1}{2} \times 4$

3. (a) What do you mean by subgroup of group ? Find out the subgroups of D_{4h} group. 3

(b) Find out the point group of the following molecules / ions :

(i) B_2H_6

(ii) $(C_6H_6)Cr(CO)_3$

(iii) mer–$[MA_3B_3]$

(iv) $B_3N_3H_6$

(v) $XeOF_4$

(vi) $[Cr(ox)_3]^{3-}$ 3

(c) For H_2O molecule show that each of the symmetry operations belong to different classes. 3

(d) Prove that if K is conjugated with L and M then L and M are conjugated to each other. 1

Group—B

Answer any *two* questions.

4. (a) Discuss the active site structure of hemerythrin. 3

(b) Discuss the di oxygen binding mechanism in hemerythrin. 3

(c) Cite one model complex of hemerythrin. 2

(d) Discuss the magnetic behaviour in deoxy and oxy hemerythrin molecule. 2

5. (a) Explain the change of geometrical transformation during the functioning of trigger mechanism in haemoglobin/myoglobin. 2

(b) Explain the origin of red colour in blood from spectroscopic point of view. 2

(c) Explain the preferential binding of myoglobin to di-oxygen in comparison to carbon monoxide. 2

(d) Comment on the magnetic behaviour of de-oxy and oxy-hemoglobin. 2

(e) Comment on the chemical and steric protection of heme from irreversible oxidation of heme. 2

6. (a) Using "Great orthogonality theorem" verify that the vectors whose components are characters of two different irreducible representations are othogonal. 3

(b) Derive the matrix form of all symmetry operations present in $POCl_3$ molecule. 5

(c) Show that no two class of a group can share a common element. 2

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