2018

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*)

Group—A

Answer any *four* questions : 4×2

1. (a) What are the differences between reducible and irreducible representations of a group ?

(b) Write all the symmetry operations present in C_6H_6.

(c) What do you mean by Tand *R* form of hemoglobin ?

(d) Comment on the magnetic behaviours of deoxy and oxyhemoglobin.

(e) What is Ceruloplasmin protein ?

(f) What do you mean by screw axis in a crystallographic system ?

(g) What is glide plane ? Explain.

(h) Define point group of a crystal system.

Group—B

Answer any *one* question : 1×4

2. (a) (i) Show that no two classes of a group can share a common element.

(ii) Prove that if L is conjugate with M and N, then M and N are also conjugate with each other. 2+2

(b) What do you mean by sub-group of a group ? Determine the sub-groups of D_{4h} group. 1+3

Group—C

Answer any *one* question : 1×4

3. (a) (i) Deoxygenated hemoglobin is dark-bluish red in colour, however, oxygenated spices is red in colour—Discuss. 3

(ii) Schematically show the 'picket-fence model'. 1

(b) (i) Schematically show the oxygenation of hemery thrin mentioning the intermediate ? What kind of reaction it is ? 2

(ii) What are the main functions of heme protein ? 2

Group—D

Answer any *two* question : 2×4

4. (a) Show that the reciprocal lattice of simple cubic lattice is also a simple cubic lattice. 4

(b) State the meaning and draw stereographic projections of the following point groups. 4

(i) *mmm* (ii) $4/m\ mm$ (iii) $\bar{6}\ m\ 2$ (iv) $m\ 3$.

(c) For an orthorhombic lattice the three sides are $10\,\mathring{A}$, $10\,\mathring{A}$ and $15\,\mathring{A}$. Number of lattice points per unit cell 4(*i.e.* $z = 4$).Molar mass of this species is 600 g. Then what will be the density of that lattice ? 4

(d) A certain crystal system reflects monochromatic x-ray strongly when Bragg's angle (first order) is 15°. What are the glancing angles for second and third order spectrum ? 4

Group—E

Answer any *one* questions : 1×8

5. (a) (i) The distal protein drastically rduces the coaffinity of hemoglobin and myoglobin—justify the statement. 3

(ii) How does nature protect *Fe*(II) in hemoglobin from its irreversible oxidation in the presence of O_2 ? 2

(iii) Discuss the formation of ferritin by biomineralisation of process. 3

(b) (i) Write down the schematic presentation of the *mechanism involved in* the hydrolysis of peptides by carboxy peptidase enzyme. 4

(ii) Why nature has designed the enzyme Carbonic anhydrase ? Draw the active site of the said enzyme. 2

(iii) What is Wilson's disease ? 2

Group—F

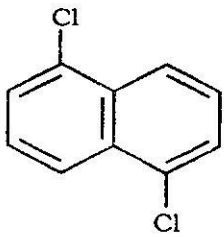
Answer any *one* question : 1×8

6. (a) Derive the matrix form of symmetry operations present in SO_3^{2-} anion. 2

(b) Identify the point group for each of the following moleculer / ions. 5+3

(i) NO (ii) SO_4^{2-} (iii) $B_3N_3H_6$ (iv) CO_3^{-2}

(v)



(vi) ClF_3

7. (a) Derive the matrix form of $S_n(y)$ symmetry element. 3

(b) What do you mean by "abelian group" ? Show that C_{2v} is an"abelian group" but C_{3v} is a "non-abelian" group. 1+4

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