2017

M.Sc.

1st Semester Examination

CHEMISTRY

PAPER—CEM-103

Subject Code—24

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 *one* question.

1. (a) Discuss the active site structure of the enzyme carboxy peptidase A. 2

(b) Explain the mechanism of peptide bond hydrolysis of carboxy peptidase A. 4

(c) What is the role of central metal ion in the function of the above mentioned enzyme. 2

(d) Write down the overall chemical reaction involved in ferritin mineralization. 2

2. (a) Discuss the recycling of iron in red blood cells. 3

(b) Propose the mechanism of action of the enzyme carbonic anhydrase. 2

(c) Explain the preferential binding of myoglobin to O_2 in comparison to CO. 2

(d) Write down the enzymatic mechanism of urease. 3

Group—B

Answer any *one* question.

3. (a) What do you mean by "Abelian group" ? 2

(b) Find out the inversion operation of S_n^m operation when

(i) n is even and m is odd, and

(ii) n is odd, m is even. 2

(c) Derive matrix representation of vertical planes in $POCl_3$ molecule. 4

(d) Prove that if P is conjugate with Q and R, then Q and R also conjugate with each other. 2

4. (a) Using "Great Orthogonality Theorem" prove that the sum of the squares of the characters in any irreducible representation equals to the order of the group. 2

(b) *Identify the point group for each of the following molecules :*

(i) $XeOF_4$

(ii) *mer*-$[MA_3B_3]$

(iii) N_2O

(iv) B_2H_6. 2

(c) What do you mean by class of a group ? Determine the classes present in *trans*-N_2F_2 molecule. 2

(d) Prove that if a C_4 axis and one plane containing this axis exists then there must be a second plane which contain C_4 axis and at an angle of 45° to the first one. 2

(e) Determine the subgroups present in D_{3h} group. 2

Group—B

Answer any *one* question.

5. (a) What is reciprocal lattice ? Derive an expression for reciprocal lattice. 3

(b) For an orthorhombic lattice the three sides are 10Å, 10Å, 15Å. Number of Lattice points per unit cell are 4. Molar mass of this species is 600g. Then what will be the density of that lattice ? 3

(c) Write short notes on :

(i) Crystal system ;

(ii) Point group. 4

6. (a) If x-rays of wave length 0.5Å are defracted at an angle at 5° in the first order. What is the spacing between the adjacent planes of the crystal ? At what angle will second maximum occur ? 4

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

(i) $\bar{3}$m

(ii) $^{6}/_{m}$ mm

(iii) 4 mm

(iv) 23 $1\frac{1}{2} \times 4$

Group—D

Answer any *five* questions.

7. (a) What do you mean by endo and exo peptide ?

(b) What is Wilson's disease ?

(c) With regular trigon how many regular polyhedrons are possible ? Explain.

(d) Derive matrix form of $C_n(y)$ symmetry operation.

(e) Write all symmetry operation present in regular octahedral molecule.

(f) What is screw axis ? Explain.

(g) What is space group ? How can we derive it ? 5×2