



S-3482

M. Sc. (Part - I) (Sem. I) (Self Finance) Examination
March / April - 2011
Inorganic Chemistry : Paper - I

Time : 3 Hours]

[Total Marks : 70

Instructions :

(1)

नीचे दशांशों में निशानीवाणी विगतो उत्तरवही पर अवश्य लिखनी. Fillup strictly the details of signs on your answer book.	Seat No. :
Name of the Examination :	<input type="text"/>
<input type="text" value="M. SC. (PART - 1) (SEM. 1) (SELF FINANCE)"/>	<input type="text"/>
Name of the Subject :	<input type="text"/>
<input type="text" value="INORGANIC CHEMISTRY - 1"/>	<input type="text"/>
Subject Code No. : <input type="text" value="3"/> <input type="text" value="4"/> <input type="text" value="8"/> <input type="text" value="2"/>	Section No. (1, 2,.....) : <input type="text" value="NIL"/>
Student's Signature	

(2) Figures to the **right** indicate full marks of the question.

- 1 Write any **three** from the following : 14
- (a) 'Eigen value of Hermitian operator are real ' Prove
- (b) What is similarity transformation ? Determine the classes of C_{3v} point group.
- (c) What is paramagnetism ? How it arises in substances?
- (d) What is antiferro magnetic interaction ? Explain the observed magnetic moment of cupric acetate is equal to 1.44 B.M.
- 2 Attempt any **three** from the following : 14
- (a) Give the expression for angular momentum in quantum mechanics.
- (b) State the orthogonality theorem and give its consequences.
- (c) Determine the ground state terms for d^2 and d^8 configurations. How many microstates obtained in each configurations ?
- (d) Explain spin-orbit coupling .Give its importance in explaining the magnetic properties of a substance.
- 3 Answer any **three** from the following : 14
- (a) Derive the energy equation for particle moving on a sphere.
- (b) Explain shift operator with special reference to angular momentum.

(c) Show that $[\hat{x}, \hat{p}_x] = i \frac{h}{2\pi}$

(d) What is simple harmonic oscillator? Derive the quantum mechanical equation for the energy of harmonic oscillator. What is Zero point energy?

4 Write any **three** from the following: 14

(a) Find out the symmetry elements possessed by the following molecules and assign their point groups.

(1) AsH_3 (2) Si_2H_6 (3) N_2F_2 (trans) and (4) eIF_5 .

(b) Write matrix notation for symmetry operation of C_3V point group.

Find out the product of two matrices

i.e. $[C_3+] \cdot [\sigma V_1] = [?]$.

(c) State the properties of irreducible representations. Construct the character table for C_3V point group.

(d) What are reducible and irreducible representations? Give the relation between them. Obtain the irreducible components of the representations given below.

C_4V	E	$2C_4$	C_2	$2\sigma V$	$2\sigma d$
$\pi_{(R)}$	6	0	2	0	0

5 Answer any **three** from the following: 14

(a) Describe the Faraday method for determination of magnetic susceptibility of a substance.

(b) Explain Temperature independent paramagnetism with suitable example.

(c) What do you mean by orbital contribution to the magnetic moment? Explain the mechanism how quenching of orbital magnetic moment occurs.

(d) Define the term:

(i) Intensity of magnetisation

(ii) Magnetic moment

(iii) Magnetic permeability

(iv) Ferromagnetism

Character Table for C_4V point group:

C_4V	E	$2C_4$	C_2	$2\sigma V$	$2\sigma d$
A_1	1	1	1	1	1
A_2	1	1	1	-1	-1
B_1	1	-1	1	1	-1
B_2	1	-1	1	-1	1
E	2	0	-2	0	0