

Seat No. : _____

DK-117

December-2017

M.Sc., Sem.-I

401 : Inorganic Chemistry

Time : 3 Hours]

[Max. Marks : 70

1. (A) Write a note on step-up and step-down operators. 7
OR
Using variation method, calculate the eigen value for H-atom.
(B) Give a full account of spherical harmonics. 7
OR
Calculate the first order correction term for the eigen function by using perturbation method.
2. (A) Explain the similarity transformations. 7
OR
Explain the Great Orthogonality theorem.
(B) By using the wave functions as the bases for the irreducible representations, prepare the matrices for operations of NH_3 molecule. 7
OR
Write the characters of the representation of the following direct products and determine the irreducible representation which comprise them for the point group D_{3h} : $A'_2 \times E'$.
3. (A) Discuss Curie-Weiss Law. 7
OR
Explain the "Pascal's constants" with example.
(B) Discuss Diamagnetism & Diamagnetic substance. 7
OR
Write a note on Intermolecular antiferromagnetism.
4. (A) Write a note on Nitrogenase and its mechanism. 7
OR
Write a note on discovery of Cisplatin, synthesis and mode of action.
(B) Write a note on cytochromes. 7
OR
Write notes on (i) Gold compounds in arthritis and (ii) Metallocenes.

5. Answer in short :

14

- (i) When will you use the perturbation method ?
 - (ii) Define angular momentum.
 - (iii) What is a Hermitian operator ?
 - (iv) On which principle does the simple harmonic oscillator operate ?
 - (v) Define orthogonal matrix.
 - (vi) What is the value of contribution to the character of $\chi(C_4)$ per unshifted atoms in Γ_{3N} ?
 - (vii) Write the reducible representation $T_1 + E$ in T_d molecule.
 - (viii) Explain the term Permeability.
 - (ix) Give the characteristic properties of paramagnetism.
 - (x) Write Lenz's law.
 - (xi) Write the drawback of MRI.
 - (xii) Write the characteristic of radioisotopes used in diagnostic purpose.
 - (xiii) Explain the term Doming.
 - (xiv) Write the structure of Silver sulphadiazine.
-

SOME CHARACTER TABLES

C_{2v}	E	C_2	$\sigma_v(xz)$	$\sigma'_v(yz)$		
A_1	1	1	1	1	z	x^2, y^2, z^2
A_2	1	1	-1	-1	R_z	xy
B_1	1	-1	1	-1	x, R_y	xz
B_2	1	-1	-1	1	y, R_x	yz

C_{3v}	E	$2C_3$	$3\sigma_v$		
A_1	1	1	1	z	$x^2 + y^2, z^2$
A_2	1	1	-1	R_z	
E	2	-1	0	$(x, y) (R_x, R_y)$	$(x^2 - y^2, 2xy) (xz, yz)$

C_{4v}	E	$2C_4$	C_2	$2\sigma_v$	$2\sigma_d$		
A_1	1	1	1	1	1	z	$x^2 + y^2, z^2$
A_2	1	1	1	-1	-1	R_z	
B_1	1	-1	1	1	-1		$x^2 - y^2$
B_2	1	-1	1	-1	1		xy
E	2	0	-2	0	0	$(x, y) (R_x, R_y)$	(xz, yz)

C_{2h}	E	C_2	i	σ_h		
A_g	1	1	1	1	R_z	x^2, y^2, z^2, xy
B_g	1	-1	1	-1	R_x, R_y	xz, yz
A_u	1	1	-1	-1	z	
B_u	1	-1	-1	1	x, y	

D_{3h}	E	$2C_3$	$3C_2$	σ_h	$2S_3$	$3\sigma_v$		
A'_1	1	1	1	1	1	1		$x^2 + y^2, z^2$
A'_2	1	1	-1	1	1	-1	R_z	
E'	2	-1	0	2	-1	0	(x, y)	$(x^2 - y^2, 2xy)$
A''_1	1	1	1	-1	-1	-1		
A''_2	1	1	-1	-1	-1	1	z	
E''	2	-1	0	-2	1	0	(R_x, R_y)	(xy, yz)

