Seat No. :

N24-104

December-2014

M.Sc., (Sem.-I)

401 : Chemistry, Paper – 1

(Inorganic Chemistry)

Time : 3 Hours] [Max. Marks : 70

1. Answer the following questions :

(a) For $\psi = e^{-ar}$, find out the amount of energy for Hydrogen atom by applying variation principle. 7

OR

For first order perturbation, find out the values for correction to the energy and wave function.

(b) Explain step up and step down operators of angular momentum. Prove that $[L_+, L_-] = 2\hbar L_z$. 7

OR

For simple Harmonic Oscillator, prove that $E = \frac{1}{2} ka^2$.

2. Answer the following questions :

(a) Explain the Great Orthogonality theorem. Discuss its five important rules about irreducible representations and their characters. 7

OR

Explain what character table is. Explain its different compartments.

(b) Taking wave function as the basis for irreducible representation for C_3v point group, considering 2px and 2py orbitals as the nitrogen atom in anmonia as the basis, calculate the values for $\chi(E)$, $\chi(C3)$ and $\chi(\sigma v)$. 7

OR

Find out the direct product for (i) $T_2 \times T_1$ and (ii) $E \times T_1$ in Td.

3. Answer the following questions :

(a) Write differences between Curie's Temperature & Neel Temperature. 7

OR

Write the statement of 'Lenz's law and derive the equation for Orbital Magnetic Moment : $\mu = \sqrt{l(l+1)}$ B.M.

(b) Discuss the importance of 'Pascal Constant' and its utility and calculate the value of χ_{dia} for (i) PPh_3 and (ii) Bipy. 7

OR

What are magnetically dilute substance ? Explain : Super exchange interaction and intermolecular antiferromagnetism.

4. Answer the following questions :

(a) Discuss the classification of elements in bioinorganic chemistry and discuss Fe-Cycle. 7

OR

Discuss '*In Vitro*' nitrogen fixation.

(b) Write a note on Cytochrome. 7

OR

Discuss the role of metals as :

(i) Radio – Diagnostic Agents and

(ii) Antimicrobial Agents

5. Answer the following questions in short : 14

(1) By applying commutator relationship, how one can prove Heisenberg uncertainty principle ?

(2) What is the value of angular momentum operator $\hat{Lx}$?

(3) Write the Perturbation equation and explain each terms involve in it.

(4) Which quantum number is obtained by solving θ equation ?

(5) Describe the implied symmetry of the irreducible representation Ag in point group C_{2h} on the basis of Mulliken symbol.

(6) What will be the character of a doubly degenerate irreducible representation under identity operation ?

(7) The energy integral $\int \psi i\ H\ \psi j\ dT$ is zero. What are the circumstances which lead to the above requirements for the molecular point group ?

(8) Give example of intramolecular Antiferromagnetism.

(9) Give the equation for velocity of 'Torque' produces during magnetic induction.

(10) Define Magnetic induction.

(11) What is 'Menkes disease' ?

(12) Excess amount of Mn causes _____.

(13) The heaviest element in biological system is tungsten found in some bacteria, which one is the second heaviest element in biological system ?

(14) What is the structure of ATP ?
