Seat No. : _____

NO-111

December-2015

M.Sc., Sem.-I

401- Chemistry

(Inorganic Chemistry)

Time : 3 Hours] **[Max. Marks : 70**

1. Answer the following questions :

(a) For simple harmonic oscillator prove that $E = \frac{1}{2} ka^2$. **7**

OR

Explain step up and step down operators of angular momentum. Prove that $(L_+, L\_] = 2\hbar Lz$.

(b) State Perturbation principle. Give its application to the Helium atom. **7**

OR

For $\psi = e^{-ar}$, find out the amount of energy for Hydrogen atom by applying variation principle. $\left((\text{Given: } \int e^{-kr} r^n dr = \frac{n!}{(k)^{n+1}}) \right)$.

2. Answer the following questions :

(a) Write the characters of the representation of the following direct products and determine the irreducible representation which comprise them for the point group D_{6h}: Alu × Alu. **7**

OR

For a point with a coordinate *x*, y, z obtain the matrix for symmetry operation E and Cn.

(b) State and explain five important rules about irreducible representations and their characters. **7**

OR

Label and explain all the components of character table. With the help of reduction formula reduce the following representation into its irreducible components.

C_{3V}	E	$2C_3$	$3_{\sigma V}$
Γ1	7	–2	1

3. Answer the following questions :

(a) Explain the terms Ferromagnetism and Antiferromagnetism. Distinguish between the properties of the compounds exhibiting such phenomenon. **7**

OR

Discuss Curie-Weiss Law.

(b) Explain the "Pascal's constants" with example. **7**

OR

Explain Antiferromagnetism in (i) $Cu_2(OOCH_3)_4.2H_2O$ and

(ii) bis (diazoamino-benzenato) copper(II)

4. Answer the following questions :

(a) (i) Write a note on vitamin B12. **4**

(ii) Discuss magnetic resonance imaging. **3**

OR

(i) Discuss in detail cytochromes. **4**

(ii) Discuss the role of gold complexes in rheumatoid arthritis. **3**

(b) (i) Write a note on hemoglobin and myoglobin. **4**

(ii) Write a note on metallocenes. **3**

OR

(i) Discuss the antibacterial agents. **4**

(ii) Discuss zinc metalloenzymes. **3**

5. Answer the following questions in short. **14**

(1) Write the equation of energy of the HMO.

(2) What is the application of step up and step down operators ?

(3) What is the application of commutator relationship ?

(4) In the harmonic oscillator, the equation : force = – proportionality constant × displacement, is based on which law ?

(5) Give an example of orthogonal matrix.

(6) How do we designate all one dimensional representation in character table ?

(7) When is kronecker delta equals zero ?

(8) An electric dipole transition will be allowed with *x*, y or z polarization if ….

(9) Give examples of molecules for intermolecular Antiferromagnetism.

(10) Write the definition of "Neel Temperature".

(11) Define "Hysteresis".

(12) What is the biological function of manganese ?

(13) What is the bond energy of N_2 ?

(14) Complete the following reaction :