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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 $(L_+, L_-) = 2\hbar L_z$.

- (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} : $Alu \times Alu$.

7

OR

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

- (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	$2C_3$	$3\sigma_v$
Γ_1	7	-2	1

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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) $\text{Cu}_2(\text{OOCH}_3)_4 \cdot 2\text{H}_2\text{O}$ and

(ii) bis (diazamino-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 \times displacement, is based on which law ? GujaratStudy.com

- (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 :

