P.B.SIDDHARTHA COLLEGE OF ARTS & SCIENCE

DEPARTMENT OF CHEMISTRY

M.Sc – CHEMISTRY (ORGANIC CHEMISTRY)

I SEMESTER

W.E.F 2022-23 (R22 Regulations)

Title of the Paper: INORGANIC CHEMISTRY

Course Code	**22CH1T2**	Course Delivery Method	Class Room / Blended Mode - Both
Credits	4	CIA Marks	30
No. of Lecture Hours / Week	4	Semester End Exam Marks	70
Total Number of Lecture Hours	60	Total Marks	100
Year of Introduction :2017-18	Year of Offering: 2022 - 23	Year of Revision: ----	Percentage of Revision: 0%

S.No	COURSE OUTCOMES	PO`S
	After completion of the course, the student will be able to :	
1	Memorize the basic concepts of quantum chemistry, co-ordination chemistry and chemical Bonding.	2
2	Comprehend the role of basic and advanced concepts of quantum chemistry, co-ordination chemistry and chemical bonding.	1,7
3	Execute the conceptual knowledge gained in the concepts of quantum chemistry, co-ordination chemistry and chemical bonding in chosen job role.	1,4
4	Investigate the role and importance of concepts of quantum chemistry, co-ordination chemistry and chemical bonding in various allied fields of chemistry.	1,7

Syllabus

Course Details

Unit	Learning Units	Lecture Hours
I	**Introduction to Exact Quantum Mechanical Results:** Schrodinger equation, importance of wave function, Operators, Eigen values and Eigen functions, derivation of wave equation using operator concept. Discussion of solutions of Schrodinger's equation to some model systems viz. particle in one dimensional box (applications), three-dimensional box, Rigid rotator system and the Hydrogen atom. Variation theorem, linear variation principle, perturbation theory (first order and non-degenerate), Application of variation method to the Hydrogen atom.	12
II	**Chemistry of non- transition elements:** Halogen oxides and oxy fluorides, Spectral and Magnetic properties of Lanthanides and Actinides. Analytical applications of Lanthanides and Actinides. Synthesis, properties and structure of B-N, S-N, P-N cyclic compounds. Intercalation compounds. **Metal π- complexes:** preparation, structure and bonding in Nitrosyl, Dinitrogen and Dioxygen complexes.	12
III	**Structure and Bonding:** pπ-dπ bonding, Bent's rule, Non-valence	12

	cohesive forces, VSEPR theory. Molecular Orbital theory, Molecular orbitals in triatomic (BeH_2) molecules and ions (NO_2^-) and energy level diagrams. Walsh diagrams for linear (BeH_2) and bent (H_2O) molecules.	
IV	**Metal–ligand bonding:** Crystal Field Theory of bonding in transition metal complexes-Splitting of d-orbitals in octahedral, tetrahedral, square planar, Trigonal bipyramidal and Square pyramidal fields. Tetragonal distortions - Jahn-Teller effect. Applications and limitations of CFT. Experimental evidences for covalence in complexes. Molecular Orbital Theory of bonding for Octahedral, tetrahedral and square planar complexes. π-bonding and MOT - Effect of π - donor and π -acceptor ligands on Δo. Experimental evidence for π - bonding in complexes.	12
V	**Metal – ligand Equilibria in solutions:** Step wise and over all formation constants. Trends in stepwise formation constants (statistical effect and statistical ratio). Determination of formation constants by Spectrophotometric method (Job's method) and pH metric method (Bjerrum's). Stability correlations - Irwing -William's series. Hard and soft acids and bases (HSAB).	12

Reference Books:

1. Inorganic Chemistry Huheey, Harper and Row.
2. Physical methods in inorganic chemistry, R.S. Drago. Affliated East-West Pvt. Ltd.
3. Concise inorganic chemistry, J. D. Lee, ELBS.
4. Modern Inorganic Chemistry, W. L. Jolly, McGrawHill.
5. Inorganic Chemistry , K. F. Purcell and J. C. Kotz Holt Saunders international.
6. Concepts and methods of inorganic chemistry, B. E. Douglas and D.H.M.C.
7. Daniel, oxford Press.
8. Introductory quantum mechanics , A. K. Chandra
9. Quantum Chemistry, R. K. Prasad.
10. Inorganic Chemistry ,Atkins, ELBS
11. Advanced Inorganic Chemistry ,Cotton and Wilkinson, Wiley Eastern
12. Quantum Chemistry, Levine.
13. Text book of Coordination chemistry ,K.SomaSekhar rao and K.N.K. Vani, Kalyani Publishers.
14. Theoretical Inorganic Chemistry by G.S.Manku, Tata Mc GrawHill, 2000, reprint.
15. Concise co-ordination chemistry, R.Gopal, Ramalingam, Vikas Publishing, House, 2014.
16. Inorganic Chemistry – Huheey, A.Keiter, L.Keiter, 4th edition, Pearson education, Asia.

Course Focus: Employability.

M.Sc. DEGREE EXAMINATION

FIRST SEMESTER

Paper-II :: Inorganic Chemistry - I

Time: 3 hours **Maximum Marks: 70**

SECTION – A

Answer all the questions. Each question carries 4 marks. (5x4M=20M)

1. (a) Explain the significance of approximation methods. (CO-2, L - 2)

(Or)

(b) Define operator. Explain the significance of operators in quantum mechanics. (CO-2, L - 2)

2. (a) Discuss about Intercalation compounds. (CO-2, L - 2)

(Or)

(b) Enumerate the significance of natural oxygen carriers. (CO-2, L- 2)

3. (a) Explain the role of VSEPR theory in predicting the geometry of molecule. (CO-2, L - 2)

(Or)

(b) Give an account on important features of MO theory. (CO-2, L - 2)

4. (a) Explain the splitting of d-orbitals in square pyramidal crystal field. (CO-2, L - 2)

(Or)

(b) Discuss about crystal field stabilization energy. (CO-2, L - 2)

5. (a) Derive a relation between stepwise and overall formation constants. (CO-2, L –2)

(Or)

(b) What is chelate effect? Explain with an example. (CO-2, L - 2)

SECTION – B

(10x5=50M)

UNIT - I

6. (a) Write down the wave equation for rigid rotor and solve it to get eigen functions. (CO-3, L - 3)

(Or)

(b) Arrive at the expression for first order non degenerate eigen values of perturbation method.

(CO-3, L - 3)

UNIT – II

7. (a) Write an account on phosphorus-nitrogen cyclic compounds. (CO-2, L - 2)

(Or)

(b) Explain the structure and bonding in nitrosyl complexes. (CO-2, L - 2)

UNIT – III

8. (a) Draw and explain the molecular orbital energy level diagram of BeH_2 molecule. (CO-3, L - 3)

(Or)

(b) Explain the evidences for pπ – dπ bonding in non-transition metal compounds. (CO-3, L - 3)

UNIT - IV

9. (a) Discuss tetragonal distortion in an octahedral complex with a suitable example. (CO-3, L - 3)

(Or)

(b) Why CN^- and CO cause greater crystal field splitting and I^- and Br^- cause lesser crystal field splitting? Explain. (CO-3, L-3)

UNIT - V

10. (a) Describe the spectrophotometric method for the determination of stability Constant. (CO-2, L- 2)

(Or)

(b) Give a detailed account on HSAB theory. (CO-2, L- 2)

******

M.Sc. DEGREE EXAMINATION

FIRST SEMESTER

Paper-III :: Organic Chemistry - I

Time: 3 hours **Maximum Marks: 70**

SECTION – A

Answer all the questions. Each question carries 4 marks. (5x4M=20M)

1. (a) Explain anti aromaticity with example. (CO-2, L - 2)

(Or)

(b) Explain cross conjugation with example. (CO-2, L - 2)

2. (a) Explain the structure of nitrenes. (CO-2, L - 2)

(Or)

(b) Discuss the structure of carbenes. (CO-2, L - 2)

3. (a) Discuss cram's rule with suitable examples. (CO-2, L - 2)

(Or)

(b) Write notes on epoxidation. (CO-2, L - 2)

4. (a) Define Hoffmann's rule. Give suitable examples. (CO-2, L - 2)

(Or)

(b) Discuss syn elimination versus anti elimination. (CO-2, L - 2)

5. (a) Give mechanism of Von-Richter rearrangement. (CO-2, L - 2)

(Or)

(b) Write noters on SNi mechanism. (CO-2, L - 2)

SECTION – B

(10x5=50M)

UNIT - I

6. a) Define delocalized chemical bonding. What are different types of delocalized chemical bonding. (CO – 2, L - 2)

(Or)

b) Explain the following terms (i) Cross Conjugation (ii)Hyper Conjugation. (CO – 2, L - 2)

UNIT - II

7. a) Discuss the generation, stability and reactivity of carbocations. (CO – 2, L - 2)

(Or)

b) Explain synthesis and few reactions of the following

(i) Free radicals (ii) Carbanions (CO – 2, L - 2)

UNIT - III

8. a) Give an account of the addition of the following to carbon carbon multiple bonds

(i) HX (ii) HOX (CO – 2, L - 2)

(Or)

b) Discuss in detail about the following

(i) Syn and Anti hydroxylation (ii) Hydrogenation (CO – 2, L - 2)

UNIT – IV

9. a) Discuss pyrolytic eliminations and its orientation. (CO – 2, L - 2)

(Or)

b) Write a detailed account of E1CB mechanism. (CO – 2, L - 2)

UNIT – V

10.a) What is anchimeric assistance. Discuss neighbouring group participation by

σ and π bonds. (CO – 3, L - 3)

(Or)

b) Explain the following (i) Benzyne mechanism (ii) SN^{Ar} mechanism. (CO – 3, L - 3)

***