Department of Chemistry and Chemical Sciences
CENTRAL UNIVERSITY OF JAMMU
Rahya-Suchani (Bagla), District-Samba,
Jammu-181143, (J&K) India

Five-year Integrated B.Sc. (Hons.) M.Sc. Chemistry
Teaching Plan (Aug 2022-Dec 2022)

Semester: V
Course: Properties of Inorganic Metal Complexes (ICCHM4C005T)
Course Teacher: Dr. Sujata Kundan

Week	Lecture No./Day	Topic to be Taught	No of Hours	Suggested Readings
1st Week	I	**Unit-I** **Electronic spectra of transition metal complexes-I:** Quantum numbers, Types of electronic transitions.	1	1, 2, 3, 9
	II	Selection rules for *d-d* transitions, Spectroscopic ground states.	1	1, 2, 3, 9
	III	Term symbols, Microstates, Spectrochemical series of ligands.	1	1, 2, 3, 9
	IV	Orbital and spin magnetic moments, Orbital contribution, Quenching of magnetic moment.	1	1, 2, 3, 9
2nd Week	I	Russel-Saunders Coupling: *l-l* coupling, *J-J* coupling, *L-S* coupling.	1	1, 2, 3, 9
	II	To be Contd…..	1	1, 2, 3, 9
	III	Derivation of Russell-Saunders terms: p^2 configuration.	1	1, 2, 3, 9
	IV	Derivation of Russell-Saunders terms: d^2 configuration.	1	1, 2, 3, 9
3rd Week	I	Orgel energy level diagram for d^1 to d^9 states, Nepheleuxatic effect.	1	1, 2, 3, 9
	II	To be Contd…..	1	1, 2, 3, 9
	III	To be Contd…..	1	1, 2, 3, 9
	IV	**Unit-II** **Magnetic properties of transition metal complexes-I:** Definition of magnetic properties, Types of magnetic bodies: Diamagnetism, Paramagnetism Ferromagnetism, Ferrimagnetism and Antiferromagnetism.	1	3, 4, 5, 6, 9
4th Week	I	To be Contd…..	1	3, 4, 5, 6, 9
	II	Mechanism of anti-ferromagnetic interaction, Spin-only formula.	1	3, 4, 5, 6, 9
	III	Spin orbit coupling, Lande interval rule.	1	3, 4, 5, 6, 9
	IV	Energies of *J*-levels.	1	3, 4, 5, 6, 9
5th Week	I	Curie equation, Curie and Curie-Weiss law.	1	3, 4, 5, 6, 9
	II	Temperature independent paramagnetism(TIP), Derivation and application of Van Vleck susceptibility equation.	1	3, 4, 5, 6, 9
	III	Magnetic exchange coupling and spin crossover (Low spin and high spin cross over).	1	3, 4, 5, 6, 9
	IV	Anomalous magnetic moments.	1	3, 4, 5, 6, 9
6th Week	I	Magnetic properties of binuclear and polynuclear complexes.	1	3, 4, 5, 6, 9
	II	**Unit-III** **Magnetic properties of transition metal complexes-II:** Magnetic susceptibility-orbital and spin effects.	1	3, 4, 5, 6, 9
	III	Importance of magnetic susceptibility, Diamagnetism and Pascals's constant.	1	3, 4, 5, 6, 9

	IV	Gouy's method, Faraday method.	1	3, 4, 5, 6, 9
7th Week	I	Vibrating sample magnetometer, SQUID, NMR method for measuring magnetic susceptibility.	1	3, 4, 5, 6, 9
	II	To be Contd…..	1	3, 4, 5, 6, 9
	III	Correlation of μs and μeff values, Orbital contribution to magnetic moments.	1	3, 4, 5, 6, 9
	IV	Magnetic properties based on crystal field models: Octahedral, Tetrahedral.	1	3, 4, 5, 6, 9
8th Week	I	To be Contd…..	1	3, 4, 5, 6, 9
	II	Trigonal bipyramidal, Square pyramidal.	1	3, 4, 5, 6, 9
	III	To be Contd…..	1	3, 4, 5, 6, 9
	IV	tetragonally distorted octahedral complexes, Diamagnetism in atoms and polynuclear systems.	1	3, 4, 5, 6, 9
9th Week	I	To be Contd…..	1	3, 4, 5, 6, 9
	II	**Unit-IV** **Metal π-complexes–I:** Metal carbonyls, Classification of metal carbonyls.	1	1, 2, 7, 8, 9
	III	Effective atomic number, Preparation and important reactions (substitution, nucleophilic, electrophilic, reduction reactions) of metal carbonyls, Structure and chemical bonding in metal carbonyls.	1	1, 2, 7, 8, 9
	IV	To be Contd…..	1	1, 2, 7, 8, 9
10th Week	I	To be Contd…..	1	1, 2, 7, 8, 9
	II	To be Contd…..	1	1, 2, 7, 8, 9
	III	Preparation of anionic metal carbonyl complexes and Substituted metal carbonyl complexes.	1	1, 2, 7, 8, 9
	IV	To be Contd…..	1	1, 2, 7, 8, 9
11th Week	I	Vibrational spectra of metal carbonyls for bonding and structural elucidation, Application of metal carbonyls complexes.	1	1, 2, 7, 8, 9
	II	To be Contd…..	1	1, 2, 7, 8, 9
	III	To be Contd…..	1	1, 2, 7, 8, 9
	IV	**Unit-V** **Metal π-complexes–II:** Dinitrogen complexes-Preparation, Structure, Bonding, and important reactions with transition metals.	1	1, 2, 7, 8, 9
12th Week	I	To be Contd…..	1	1, 2, 7, 8, 9
	II	To be Contd…..	1	1, 2, 7, 8, 9
	III	Dioxygen complexes-Preparation, Structure, Bonding, and important reactions with transition metals.	1	1, 2, 7, 8, 9
	IV	To be Contd…..	1	1, 2, 7, 8, 9
13th Week	I	To be Contd…..	1	1, 2, 7, 8, 9
	II	Metal nitrosyls complexes-Preparation, Structure, Bonding, and important reactions with transition metals.	1	1, 2, 7, 8, 9
	III	To be Contd…..	1	1, 2, 7, 8, 9
	IV	To be Contd…..	1	1, 2, 7, 8, 9
14th Week	I	Ligating behaviour of tertiary phosphines.	1	1, 2, 7, 8, 9
	II	Isopoly and heteropoly acids.	1	1, 2, 7, 8, 9
	III	To be Contd…..	1	1, 2, 7, 8, 9
	IV	To be Contd…..	1	1, 2, 7, 8, 9

15th Week	I	Salts of molybdenum and tungsten.	1	1, 2, 7, 8, 9
	II	To be Contd…..	1	1, 2, 7, 8, 9
	III	To be Contd…..	1	1, 2, 7, 8, 9
	IV	Revision of Units I, Discussion of model question papers	1	1, 7
16th Week	I	Revision of Units II, Discussion of model question papers	1	
	II	Revision of Units III, Discussion of model question papers	1	
	III	Revision of Unit IV, Discussion of model question papers	1	
	IV	Revision of Units V, Discussion of model question papers	1	

REFERENCES

1. B. R. Puri, L. R. Sharma and K. C. Kalia, *Principal Of Inorganic Chemistry*, Vishal Publishing Co., 2020.
2. Malik, Tuli and Madan, *Selected Topics in Inorganic Chemistry*, S. Chand & company, New Delhi, 2009.
3. P. Atkins, T. Overton, J. Rourke, M. Weller and F. Armstrong, *Inorganic Chemistry*, Oxford University Press, 2006.
4. A. Earnshaw, *Introduction to Magnetochemistry*, 1st Ed., Academic Press, 1968.
5. F. B. Mabbs, D. J. Machin, et al., *Magnetism and Transition Metal Complexes*, Dover Books, 2008.
6. A. Syamal, *Elements of Magnetochemistry*, 2nd Ed., East-West Press Pvt. Ltd., 2004.
7. J. E. Huhey, Harpes and Row, *Inorganic Chemistry*, 4th Ed., Pubs: Harper Collins 2006
8. J. D. Lee, *Concise Inorganic Chemistry*, 5th Ed., John Wiley & Sons, 2008.
9. In-house Study material.