School of Chemistry Faculty of Science University of the Punjab, Lahore Course Outline



BS Chemistry Semester-VI							
Program	ne	BS (Chemistry)	Course Code	Chem-3	16	Credit Hours	2
Course Ti	ourse Title Coordination Chemistry Course			Course	Гуре	Major	,
		Co	urse Introduction	n			
It will help the students to understand the basic chemistry of d block elements and their coordination compounds, along with their applications on industrial scale due to their advanced stability, chelating ability and catalytic nature. Here is a brief description of course outlines: Structure & Bonding Introduction of transition elements, complex/coordination compounds/double salts, Development of coordination compounds: Bloom strand theory, Werner Theory, VBT; Hybridization in coordination compounds with coordination number from 2 to 9. Important features of CFT, d-orbitals splitting for various common geometries, measurement of 10 Dq., factors effecting 10 Dq. CFSE, Applications of CFT in explaining color, spinels etc. MOT; MO diagrams for metal complexes of common geometry. Ligand Field Theory (LFT) Synthesis and properties Introduction, Ionization, Hydrate/Solvate, Ligand, Linkage, Fluxional, and Spin isomerism). Stereochemistry (geometric and optical isomerism in compounds with coordination numbers 4 and 6). The spectrochemical series and factors affecting high/low spin. Magnetism (Diamagnetism and Paramagnetism). Jahn-Teller effect. Thermodynamic vs. Kinetic stability, Stability constants. Analytical methods for studying complexes. Role of metal complexes in analytical chemistry, industry, and nature.							
		Le	arning Outcomes	8			
 On the completion of the course, the students will be able to: Understand the basic chemistry of d block elements and their coordination compounds, Comprehend applications on industrial scale due to their advanced stability, chelating ability and catalytic nature. Learn about the structure and coloring properties of coordination compounds. 							
Course Content Assignments/Readings					lings		
Week 1	Week 1Unit 1: Introduction of transition elements, complex/coordination compounds/double saltsReading from recommended books					ooks	
Week 2	Week 2Development of coordination compounds: Bloom strand theory,Reading recommended booksfrom					from	
Week 3	Week 3 Werner Theory Reading from recommended books						from

Week 4	VBT; Hybridization in coordination compounds with coordination number from 2 to 9.	Reading from recommended books		
Week 5	Important features of CFT,	Readingfromrecommended booksrecommended booksReadingfromrecommended booksrecommended books		
Week 6	d-orbitals splitting for various common geometries, measurement of 10 Dq., factors effecting 10 Dq. CFSE,	Reading from recommended books Examples survey		
Week 7	Applications of CFT in explaining color, spinels etc.	Readingfromrecommended booksExamples survey		
Week 8	MOT; MO diagrams for metal complexes of common geometry. Ligand Field Theory (LFT)	Readingfromrecommended booksExamples survey		
Week 9	Mid Term Assessment			
Week 10	Unit2: Introduction. Preparative methods.	Reading from recommended books		
Week 11	Isomerism in coordination compounds (Conformational, Coordination, Ionization, Hydrate/Solvate, Ligand, Linkage, Fluxional, and Spin isomerism). Stereochemistry (geometric and optical isomerism in compounds with coordination numbers 4 and 6).	Reading recommended booksfromReading recommended booksfrom		
Week 12	The spectrochemical series and factors affecting high/low spin.	Reading from recommended books Examples practice		
Week 13	Magnetism (Diamagnetism and Paramagnetism).	Readingfromrecommended bookscalculation practice		
Week 14	Jahn-Teller effect.	Readingfromrecommended booksExamples survey		
Week 15	Thermodynamic vs. Kinetic stability, Stability constants.	Reading from recommended books Examples practice		
Week 16	Analytical methods for studying complexes. Role of metal complexes in analytical chemistry, industry, and nature.	Reading from recommended books		

Textbooks and Reading Material						
1. Rayner Canham, Geiof., (1995), "Descriptive Inorganic Chemistry" & Co.						
	2. Sharp, A.G.(1992), "Inorganic Chemistry", Longman, 3rd Edition.					
3. Shriver, D.F., P.W. Atkins and C.H. Langford, (1996), "Inorganic Chemistry", Oxford,						
2nd Edition.						
4. Ullah, S., (2020) "Inorganic Chemistry", Ilmi Kitab Khana, Lahore.						
5. Rehman, R., and Bhatti, H.N., (2015) "Advanced Inorganic Chemistry", Volume I,						
Carvan Book House Lahore.6. Huheey, J. E., Keiter, E. A., Keiter, R. L.,(1997), "Inorganic Chemistry: Principles of						
	icture and Reactivit					
SIII	iciure and Reactivit	<i>y</i> , 411 ed., Flein				
		Teaching L	earning Strategies			
	1. Lecture Based	Examination (O	bjective and Subjective)			
	2. Assignments					
3. Class discussion						
1. Quiz/Tests						
	2. Presentations					
Assignments: Types and Number with Calendar						
1. Bonding in metal complexes of coordination number 5 to 9.						
	0	1				
	2. Isomerism, col	or, magnetism a	and stability in metal complexes / Applications of			
	2. Isomerism, col	1	and stability in metal complexes / Applications of			
	2. Isomerism, col	or, magnetism a pompounds in indu	and stability in metal complexes / Applications of			
Sr. No	2. Isomerism, col coordination co	or, magnetism a pompounds in indu	and stability in metal complexes / Applications of astry.			
Sr. No	 Isomerism, col coordination co Elements 	or, magnetism a ompounds in indu As	and stability in metal complexes / Applications of astry.			
	 Isomerism, col coordination co Elements 	or, magnetism a ompounds in indu As Weightage	and stability in metal complexes / Applications of astry.			
	 Isomerism, col coordination co Elements Midterm Assessment 	or, magnetism a ompounds in indu As Weightage	and stability in metal complexes / Applications of astry.			
1.	 Isomerism, col coordination co Elements Midterm Assessment 	or, magnetism a pmpounds in indu As Weightage 35%	and stability in metal complexes / Applications of astry. ssessment Details Written Assessment at the mid-point of the semester. Continuous assessment includes: Classroom participation, assignments, presentations, viva			
1.	 Isomerism, col coordination co Elements Midterm Assessment Formative 	or, magnetism a pmpounds in indu As Weightage 35%	Applications of astry. Seessment Details Written Assessment at the mid-point of the semester. Continuous assessment includes: Classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on-activities,			
1.	 Isomerism, col coordination co Elements Midterm Assessment Formative 	or, magnetism a pmpounds in indu As Weightage 35%	Indext and stability in metal complexes / Applications of astry. Sector of astry. Details Written Assessment at the mid-point of the semester. Continuous assessment includes: Classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on-activities, short tests, projects, practical, reflections,			
2.	2. Isomerism, col coordination co . Elements Midterm Assessment Formative Assessment	or, magnetism a compounds in induced and the second	Indext and stability in metal complexes / Applications of astry. Sector of astry. Details Written Assessment at the mid-point of the semester. Continuous assessment includes: Classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on-activities, short tests, projects, practical, reflections, readings, quizzes etc.			
1.	 Isomerism, col coordination co Elements Midterm Assessment Formative Assessment Final 	or, magnetism a pmpounds in indu As Weightage 35%	sessment Details Written Assessment at the mid-point of the semester. Continuous assessment includes: Classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on-activities, short tests, projects, practical, reflections, readings, quizzes etc. Written Examination at the end of the semester.			
2.	2. Isomerism, col coordination co . Elements Midterm Assessment Formative Assessment	or, magnetism a compounds in induced and the second	Indext and stability in metal complexes / Applications of astry. Sector of astry. Details Written Assessment at the mid-point of the semester. Continuous assessment includes: Classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on-activities, short tests, projects, practical, reflections, readings, quizzes etc. Written Examination at the end of the semester. It is mostly in the form of a test, but owing to the			
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2.	 Isomerism, col coordination co Elements Midterm Assessment Formative Assessment Final 	or, magnetism a compounds in induced and the second	and stability in metal complexes / Applications of astry. ssessment Details Written Assessment at the mid-point of the semester. Continuous assessment includes: Classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on-activities, short tests, projects, practical, reflections, readings, quizzes etc. Written Examination at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their			

	BS Chemistry Semester-VI							
Programme BS (Chemistry) Course Code Chemistry		Chem	a-317 Credit Hours		1			
Course T	itle	Inorganic Chemistry La	b	Cours Type	se.	Major		
Course Introduction								
<i>commercia</i> Complexon Estimation EDTA (Dir analysis). H Cd ²⁺ with H titration). H (Direct titra acidic cond Synthesis of Tris(ethyle aluminate(Pentahydra	<i>I sam</i> metry of M rect ti Estim EDTA Estim ation lition of me nedia III).	Ig ⁺² with EDTA (Direct tit itration in basic condition). ation of Zn^{2+} with EDTA (A (Direct titration in basic c ation of Al^{3+} with EDTA (I in acidic condition). Detern). tal complexes amine) nickel (II) Chloride Hexaaqua Chromium (III) Lear	<i>ption of course</i> ration in basic c Estimation of N Direct titration i condition). Estin Indirect titration mination of Co ²² 2-hydrate. Sodiu Chloride. Ammo	outlines ondition Ig ⁺² an n basic nation o). Deter ' with E um Cob onium S	: d Ca ²⁺ condition f Ni ⁺² wination DTA (lastinitri sulphate	nation of Ca ²⁺ wit with EDTA (Mix on). Estimation of vith EDTA (Indire n of Pb ²⁺ with ED Direct titration in te. Pot. trioxalato	ature ect DTA	
		on of the course, the studen			stand:			
1. 2.		ferences between simple saturatory methods for metal			v scale			
3.		imation of metal ions conce						
		Course Content			Ass	ignments/Readin	igs	
	Esti	Estimation of Mg ²⁺ with EDTA (Dire	TA (Direct titrat	t titration in	Sampl	e solution prepara	ation	
Week 1	basic condition).		,	``		Titration practice		
Weels 2	Esti	Estimation of Ca ²⁺ with EDTA (Direct titration in		ion in	Sampl	e solution prepara	ation	
Week 2 Estimation of Ca with EDTA (Direct infation in basic problem) Titration practice				on practice				
Week 3	with EDTA (M	lixture	Sample solution preparation		ation			
analysis). Titration practice								
Week 4	Estimation of Zn^{2+} with EDTA (Direct titration in basic condition).		ion in	Sampl	e solution prepara	ation		
TTUCK T				Titration practice				
Week 5	Estimation of Cd^{2+} with EDTA (Direct titration in basic condition).		ion in	Sampl	e solution prepara	ation		
WEEK J				Titration practice				
Week 6	Eat	Estimation of Ni ²⁺ with EDTA (Indirect titration).		an)	Sample solution preparation		ation	
WEEK U	Esu			л <i>.</i>	Titrati	on practice		
Work 7	E-d				Sample solution preparation		ation	
Week 7	Estimation of Al^{3+} with EDTA (Indirect titration).)II).	Titration practice				
	Determination of Pb^{2+} with EDTA (Direct titration in acidic condition).		tration	Sample solution preparation				
Week 8			Titration practice					

Week 9	Mid term assessment				
	Determination of Co ²⁺ with EDTA (Direct titration	Sample solution preparation			
Week 10	in acidic condition).	Titration practice			
XX7 1 11	Preparation of Tris(ethylenediamine) nickle (II)	Sample solution preparation			
Week 11	Chloride 2-hydrate.	Titration practice			
W l. 13	Dreponstion of Sodium Coholdinitaite	Sample solution preparation			
Week 12	Preparation of Sodium Cobaltinitrite	Titration practice			
Week 12	Propagation of Dot triovalatealuminata(III)	Sample solution preparation			
Week 13	Preparation of Pot. trioxalatoaluminate(III)	Titration practice			
Week 14	Preparation of Hexaaquachromium(III) chloride.	Sample solution preparation			
WEEK 14		Titration practice			
Week 15	Preparation of Ammonium Sulphate Copper	Sample solution preparation			
WEEK 13	Sulphate Pentahydrate.	Titration practice			
Week 16	Revision of all complexometric titrations and	Sample solution preparation			
WEEK IU	synthesis	Titration practice			
	Textbooks and Reading Material				
 Bassett, J., Denny, P. C., Jeffery, G. H., Mendham, J., (2009), "Vogel's textbook of Quantitative Inorganic Analysis", 6th ed., Pearson Education, copyrights. Pass, G., Sutcliffe, H., (1974), Practical Inorganic Chemistry: Preparation Reactions and Instrumental Methods, 2nd ed., Chapman and Hall. Rehman, R., and Bhatti, H.N., (2017), "Advanced Experimental Inorganic Chemistry" Carvan Book House Lahore. Mendham, John., (2006), "Vogel's textbook of quantitative chemical analysis". Pearson Education India. Derek Woollins, J., (2010), "Inorganic Experiments", 3rd revised edition, John Wiley & Sons. 					
Teaching Learning Strategies					
1. 2. 3.	2. Written Assignments				
	Assignments: Types and Number with Ca	lendar			
 Synthesis of metal complexes Complexometry and its application 					

	Assessment					
Sr. No.	Elements	Weightage	Details			
1.	Midterm Assessment	35%	Written Assessment at the mid-point of the semester.			
2.	Formative Assessment	25%	Continuous assessment includes: Classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on-activities, short tests, projects, practical, reflections, readings, quizzes etc.			
3.	Final Assessment	40%	Written Examination at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.			