GUJRANWALA GURU NANAK KHALSA COLLEGE, CIVIL LINES, LUDHIANA

AFFILIATED TO PANJAB UNIVERSITY, CHANDIGARH

Academic Calendar for the session 2017-18 with Under Graduate & Post Graduate Chemistry Course having Semester System of examination:-

SummerVacation	**01-06-17**	**To**	**09-07-17**	**(39 days)**
Thursday		**Sunday**		

Academic Calendar

Colleges Open on and normal **10-07-17**

Admission for on-going Classes **Monday**

Admission Schedule

Normal Admission for on-goingand new classes (except for thoseclassesin which admission isthroughPU-CET[P.G])	**17** **Saturday**	**(12 days)**

Late Admission for, ongoingClassesand new classes) to beallowed by thePrincipal of theCollege with late fee of Rs.**560/**- perstudent.	**-17**	**(7days)**
	Monday	**Thursday**
Commencement of Teaching (i) Late Foron-goingclasses	**Schedule to be provided by Dean Science**	
(ii) For new admission classes(those admitted through PU-CET (P.G) tentative		
Late admission in Panjab University, affiliated Colleges to be allowed by the Vice-Chancellor with fee of Rs. 2040/-per student	**14-08-17(12days)**	

Academic Term –I (a) **22-07-17** **To** **29-09-17** **(57 teaching**

1st& 3rd& 5th semester **Saturday** **Fridaydays)**

Autumn Break **30-09-17** **To** **09-10-17** **(10days)**

Tuesday **Monday**

Academic Term –I (b) **10-10-17** **To** **01-12-17** **(57 teaching**

Tuesday **Fridaydays)**

Total teaching days of Academic Term I = 57 + 42 = 99 Days

BACHELOR OF SCIENCE Session 2017-2018(First Semester)							
S.No.	Teacher	Class	Paper	Month	Week		Syllabus
1.	Prof. Sunny	B.Sc.-I	Paper-III Physical Chemistry-A	July	III[rd]	**UNIT-I Mathematical Concepts and Evaluation of Analytical Data :** Logarithmic relations, curve sketching, linear graphs and calculation of slopes	**UNIT-I (8 Hrs.)** **Mathematical Concepts and Evaluation of Analytical Data :** Logarithmic relations, curve sketching, linear graphs and calculation of slopes, differentiation and integration of functions like ex, xn, sin x, log x; maxima and minima, partial differentiation and reciprocity relations. Terms of mean and median, precision and accuracy in chemical analysis, determining accuracy of methods, improving accuracy of analysis, data treatment for series involving relatively few measurements, linear least squares curve fitting, types of errors, standard deviation. **UNIT-II (7Hrs.)** **Gaseous States:** Postulates of kinetic theory of gases, deviation from ideal behavior, Van der Waal's equation of state. **Critical Phenomena :** PV isotherms of real gases, continuity of states, the isotherms of Van
					IV[th]	Differentiation and integration of functions like ex, xn, sin x, log x	

				August	Ist	Maxima and minima, partial differentiation and reciprocity relations	der Waal's equation, relationship between critical constants and Van der Waal's constants, the law of corresponding states, reduced equation of state. **Molecular Velocities :**Root mean square, average and most probable velocities. Qualitative discussion of the Maxwell's distribution of molecular velocities, collision number, mean free path and collision diameter. Liquification of gases (based on Joule-Thomson effect). **UNIT-III (8 Hrs.)** **Chemical Kinetics-I :** Chemical kinetics and its scope, rate of a reaction, factors influencing the rate of a reaction-concentration, temperature, pressure, solvent, light, catalyst. Concentration dependence of rates, mathematical characteristics of simple chemical reactions – zero order, first order, second order, pseudo order, half life and mean life. Determination of the order of reaction – differential method, method of integration, method of half life period and isolation method. Radioactive decay as a first order phenomenon. **Chemical Kinetics-II :** *Theories of Chemical Kinetics:* Effect of temperature on rate of reaction, Arrhenius equation, concept of activation energy. Simple collision theory based on hard sphere model, transition state theory (equilibrium hypothesis). Expression for the rate constant based on equilibrium constant and thermodynamic aspects. Catalysis and general characteristics of catalytic reactions, Homogeneous catalysis, acid-base catalysis and enzyme catalysis including their mechanisms, Michaelis Menten equation for enzyme catalysis and its mechanism.
					IInd	Terms of mean and median, precision and accuracy in chemical analysis, determining accuracy of methods	
					IIIrd	Improving accuracy of analysis, data treatment for series involving relatively few measurements, linear least squares curve fitting, types of errors, standard deviation.	
					IVth	**UNIT-II** **Gaseous States:** Postulates of kinetic theory of gases, deviation from ideal behavior, Van der Waal's equation of state. **Critical Phenomena :** PV isotherms of real gases,	
					Vth	Continuity of states, the isotherms of Van der Waal's equation, relationship between critical constants and Vander Waal's constants	

				September	II[nd]	The law of corresponding states, reduced equation of state. **Molecular Velocities:** Root mean square, average and most probable velocities.	
					III[rd]	Qualitative discussion of the Maxwell's distribution of molecular velocities, collision number,	
					IV[th]	Mean free path and collision diameter. Liquification of gases (based on Joule-Thomson effect).	
					V[th]	**Chemical Kinetics-I :** Chemical kinetics and its scope, rate of a reaction, factors influencing the rate of a reaction-concentration,	
				October	**AUTUMN BREAK**		
					II[nd]	Temperature, pressure, solvent, light, catalyst. Concentration dependence of rates mathematical characteristics of simple chemical	

						reactions – zero order first order, pseudo order, half life and mean life.	
					III[rd]	Determination of the order of reaction – differential method,	
					IV[th]	Method of integration, method of half life period and isolation method. Radioactive decay as a first order phenomenon. **Chemical Kinetics-II :** *Theories of Chemical Kinetics:* Effect of temperature on rate of reaction,	
					V[th]	Arrhenius equation, concept of activation energy. Simple collision theory based on hard sphere model, transition state theory (equilibrium hypothesis).	
				November	I[st]	Expression for the rate constant based on equilibrium constant and thermodynamic aspects. Catalysis and general characteristics of	

						catalytic reactions, Homogeneous catalysis,	
					II[nd]	Acid-base catalysis and enzyme catalysis including their mechanisms, Michaelis Menten equation for enzyme catalysis and its mechanism	
2.	Prof. Ruchika	B.Sc-I	Paper-II Organic chemistry-A	July	III[rd]	**UNIT-I Structure and Bonding :** Hybridization, bond lengths and bond angles, bond energy, localized and delocalized chemical bond, Vander Waals interactions,	**UNIT-I (8 Hrs.)** **Structure and Bonding :** Hybridization, bond lengths and bond angles, bond energy, localized and delocalized chemical bond, Van der Waals interactions, resonance, hyperconjugation, aromaticity, inductive and field effects, hydrogen bonding. **Mechanism of Organic Reactions :** Curved arrow notation, drawing electron movements with arrows, half-headed and double-headed arrows, homolytic and heterolytic bond breaking. Types of reagents—electrophiles and nucleophiles. Types of organic reactions. Energy considerations. Reactive intermediates—Carbocations, carbanions, free radicals, carbenes, arynes and nitrenes (with examples). Assigning formal charges on intermediates and other ionic species. Methods of determination of reaction mechanism (product analysis, intermediates, isotope effects, kinetic and stereochemical studies). **UNIT –II (7 Hrs.)** **Alkanes and Cycloalkanes:** Isomerism in alkanes, sources, methods of formation (with special reference to Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation of carboxylic acids), physical properties and chemical reactions of alkanes Mechanism of free radical halogenation of alkanes: Orientation, reactivity and selectivity. Cycloalkanes – nomenclature, methods of formation, chemical reactions, Baeyer's strain theory and its limitation. Ring strain in small rings (cyclopropane and cyclobutane), theory of strainless rings. The case of cyclopropane ring: banana bonds **UNIT-III (8 Hrs.)** **Stereochemistry of Organic Compounds I:** Concept of isomerism, Types of isomerism. Optical isomerism – Elements of symmetry, molecular chirality, enantiomers, stereogenic center, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogenic centers, diastereomers, threo
					IV[th]	Resonance, hyperconjugation, aromaticity, inductive and field effects, hydrogen bonding.	
				August	I[st]	**Mechanism of Organic Reactions :** Curved arrow notation, drawing electron movements with arrows, half-headed and double-headed arrows, homolytic and heterolytic bond breaking. Types of	

						reagents electrophiles and nucleophiles.	and erythro diastereomers, meso compounds, resolution of enantiomers, inversion, retention and racemization. Relative and absolute configuration, sequence rules, D & L and R & S systems of nomenclature. **UNIT-IV (7 Hrs.)** **Stereochemistry of Organic Compounds II :** Geometric isomerism: Determination of configuration of geometric isomers. E & Z system of nomenclature, geometric isomerism in oximes and alicyclic compounds. Conformational isomerism—Conformational analysis of ethane and n-butane; conformations of cyclohexane, axial and equatorial bonds, conformation of mono and disubstituted cyclohexane derivatives. Newman projection and Sawhorse formulae, Fischer and flying wedge formulae. Difference between configuration and conformation.
					IInd	Types of organic reactions. Energy considerations. Reactive intermediates—Carbocations, carbanions, free radicals, carbenes, arynes and nitrenes (with examples).	
					IIIrd	Assigning formal charges on intermediates and other ionic species. Methods of determination of reaction mechanism (product analysis, intermediates, isotope effects, kinetic and stereochemical studies).	
					IVth	**UNIT- II** **Alkanes and Cycloalkanes:** Isomerism in alkanes, sources, methods of formation (with special reference to Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation of carboxylic acids), physical properties	

						and chemical reactions of alkanes	
				September	Ist	Mechanism of free radical halogenation of alkanes: Orientation, reactivity and selectivity. Cycloalkanes – nomenclature, methods of formation, chemical reactions	
					IInd	Baeyer's strain theory and its limitation. Ring strain in small rings (cyclopropane and cyclobutane), theory of strainless rings. The case of cyclopropane ring: banana bonds	
					IIIrd	**UNIT-III Stereochemistry of Organic Compounds I:** Concept of isomerism, Types of isomerism. Optical isomerism – Elements of symmetry, molecular chirality, enantiomers, stereogenic center,	
					IVth	Optical activity, properties of	

						enantiomers, chiral and achiral molecules with two stereogenic centers, diastereomers, threo and erythro diastereomers, meso compounds,	
					Vth	Resolution of enantiomers, inversion, retention and racemization. Relative and absolute configuration, sequence rules, D & L and R & S systems of nomenclature.	
				October	**AUTUMN BREAK**		
					IInd	**UNIT-IV Stereochemistry of Organic Compounds II :** Geometric isomerism: Determination of configuration of geometric isomers. E & Z system of nomenclature	
					IIIrd	Geometric isomerism in oximes and alicyclic compounds. Conformational isomerism— Conformational analysis of ethane and n-butane;	
					IVth	Conformations of	

						cyclohexane, axial and equatorial bonds, conformation of mono and disubstituted cyclohexane derivatives.	
				November	Ist	Newman projection and Sawhorse formulae, Fischer and flying wedge formulae.	
					IInd	Difference between configuration and conformation	
3.	Prof. Jyoti	B.Sc.-I	Paper-I Inorganic Chemistry-A	July	IIIrd	**UNIT-I** **Atomic Structure :** Idea of de Broglie matter waves, Heisenberg uncertainty principle, atomic orbitals, Schrodinger wave equation, significance of Y and Y2	**UNIT-I (8 Hrs.)** **Atomic Structure :** Idea of de Broglie matter waves, Heisenberg uncertainty principle, atomic orbitals, Schrodinger wave equation, significance of Ψ and Ψ^2, quantum numbers, radial and angular wave functions and probability distribution curves, shapes of *s, p, d* orbitals. Aufbau and Pauli exclusion principles, Hund's multiplicity rule. Electronic configurations of the elements and ions. **UNIT-II (7 Hrs.)** **Periodic Properties :** Position of elements in the periodic table; effective nuclear charge and its calculations. Atomic and ionic radii, ionization energy, electron affinity and electronegativity—definition, methods of determination or evaluation, trends in periodic table and applications in predicting and explaining the chemical behaviour. **UNIT-III (7 Hrs.)** **Chemistry of Noble Gases and *s*-Block Elements :** Chemical properties of the noble gases, chemistry of xenon, structure and bonding in xenon compounds. Comparative study, diagonal relationships, salient features of hydrides, solvation and complexation tendencies including their function in biosystems, an introduction to alkyls and aryls. **UNIT-IV (8 Hrs.)** **Chemical Bonding-I :**Covalent Bond – Valence bond theory and its limitations, directional characteristics of covalent bond, various types of hybridization and shapes of simple
					IVth	Quantum numbers, radial and angular wave functions and probability distribution curves	
				August	Ist	Shapes of *s, p, d*orbitals. Aufbau and Pauli exclusion principles, Hund's multiplicity rule. Electronic configurations of the	

						elements and ions.	inorganic molecules and ions. BeF_2, BF_3, CH_4, PF_5, SF_6, IF_7, $SnCl_2$, XeF_4, BF^-_4, PF^-_6, $SnCl^{2-}_6$. Valence shell electron pair repulsion (VSEPR) theory to NH_3, H_3O+, SF_4, ClF_3, ICl^-_2 and H_2O. MO theory, homonuclear (elements and ions of 1st and 2nd row), and heteronuclear (BO,CN, CO^+, NO^+, CO, CN^-), diatomic molecules. Percentage ionic character from dipole moment and electronegativity difference.
					II[nd]	**UNIT-II Periodic Properties :**Position of elements in the periodic table; effective nuclear charge and its calculations. Atomic and ionic radii,	
					III[rd]	Ionization energy, electron affinity and electronegativity— definition, methods of determination or evaluation,	
					IV[th]	Trends in periodic table and applications in predicting and explaining the chemical behaviour.	
					V[th]	**UNIT-III Chemistry of Noble Gases and *s*-Block Elements :**Chemical properties of the noble gases, chemistry of xenon, structure and bonding in xenon compounds.	
				September	II[nd]	Comparative study, diagonal relationships, salient features of hydrides,	
					III[rd]	Solvation and complexation	

						tendencies including their function in biosystems, an introduction to alkyls and aryls.	
					IVth	**UNIT-IV Chemical Bonding-I :** Covalent Bond – Valence bond theory and its limitations, directional characteristics of covalent bond,	
					Vth	Various types of hybridization and shapes of simple inorganic molecules and ions. BeF_2, BF_3, CH_4, PF_5, SF_6, IF_7, $SnCl_2$, XeF_4, BF^-_4, PF^-_6, $SnCl^{2-}_6$	
				October	**AUTUMN BREAK**		
					IInd	Valence shell electron pair repulsion (VSEPR) theory to NH_3, H_3O+, SF_4, ClF_3, ICl^-_2 and H_2O.	
					IIIrd	MO theory	
					IVth	Homonuclear (elements and ions of 1st and 2nd row),	
					Vth	Heteronuclear (BO, CN, CO^+, NO^+, CO, CN^-)	
				November	Ist	Diatomic molecules. Percentage ionic character from dipole	

						moment and electronegativity difference.	

BACHELOR OF SCIENCE				**Session 2017-2018(Third Semester)**			
S.No.	Teacher	Class	Paper	Month	Week		Syllabus
1.	Prof. Sunny	B.Sc.-II	Paper-XI Physical Chemistry-A	July	III[rd]	**UNIT-I Liquid State:** Intermolecular forces, structure of liquids (a qualitative description)	**UNIT-I (8 Hrs.)** **Liquid State:** Intermolecular forces, structure of liquids (a qualitative description). Structural differences between solids, liquids and gases. *Liquid Crystals :*Difference between liquid crystal, solid and liquid. Classification, structure of nematic and cholestric phases. Thermography and seven segment cell. **UNIT-II (7 Hrs.)** **Chemical Equilibrium:** Equilibrium constant and free energy. Thermodynamic derivation of law of mass of mass action. Le - Chatelier's principle. Reaction isotherm and Reaction isochore-Clapeyron equation and Clausius –Clapeyron equation, applications. **UNIT-III (8 Hrs.)** **Thermodynamics-II:** *Second Law of Thermodynamics:* Need for the law, different statements of the law, Carnot cycle and its efficiency, Carnot theorem. Thermodynamic scale of temperature. *Concept of Entropy:* Entropy as a state function, entropy as a function of V & T, entropy as a function of P & T, entropy change in physical change, Clausius inequality, entropy as a criteria of spontaneity and equilibrium. Entropy change in ideal gases and mixing of gases. **UNIT-IV (7 Hrs.)** **Thermodynamics-III:** *Third Law of Thermodynamics:* Nernst heat theorem, statement and concept of residual entropy, evaluation of absolute entropy from heat capacity data. Gibbs and Helmholtz functions; Gibbs function (G) and Helmholtz functions (A) as thermodynamic quantities, A & G as criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change. Variation of G and A with P, V and T.
					IV[th]	Structural differences between solids, liquids and gases	
				August	I[st]	*Liquid Crystals :* Difference between liquid crystal, solid and liquid	
					II[nd]	Classification, structure of nematic and cholestric phases. Thermography and seven segment cell.	
					III[rd]	**UNIT-II Chemical Equilibrium:** Equilibrium constant and free energy.	
					IV[th]	Thermodynamic derivation of law of mass of mass action. Le - Chatelier's principle.	
					V[th]	Reaction isotherm and Reaction isochore-Clapeyron equation and Clausius –Clapeyron equation, applications.	

				September	II[nd]	**UNIT-III** **Thermodynamics-II:** *Second Law of Thermodynamics:* Need for the law, different statements of the law, Carnot cycle and its efficiency	
					III[rd]	Carnot theorem. Thermodynamic scale of temperature. *Concept of Entropy:* Entropy as a state function	
					IV[th]	Entropy as a function of V & T, entropy as a function of P & T, entropy change in physical change	
					V[th]	Clausius inequality, entropy as a criteria of spontaneity and equilibrium.	
				October	**AUTUMN BREAK**		
					II[nd]	Entropy change in ideal gases and mixing of gases.	
					III[rd]	**UNIT-IV** **Thermodynamics-III:** *Third Law of Thermodynamics:* Nernst heat theorem, statement and concept of residual entropy,	
					IVth	Evaluation of absolute entropy from heat capacity data. Gibbs and Helmholtz	

						functions	
					V^{th}	Gibbs function (G) and Helmholtz functions (A) as thermodynamic quantities,	
				November	Ist	A & G as criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change.	
					II^{nd}	Variation of G and A with P, V and T.	
2.	Prof. Ruchika	B.Sc-II	Paper-X Organic chemistry-A	July	III^{rd}	**UNIT-I** **Alcohols and Phenols:** Classification and nomenclature	**UNIT-I (8 Hrs.)** **Alcohols and Phenols:** Classification and nomenclature. Monohydric alcohols-Nomenclature, methods of formation by reduction of aldehydes, ketones, carboxylic acids and esters. Hydrogen bonding. Acidic nature. Reactions of alcohols. Dihydric and Trihydric alcohols-Nomenclature, methods of formation, chemical reactions of vicinal glycols and glycerol. Preparation of phenols, physical properties and acidic character. Comparative acidic strengths of alcohols and phenols, resonance stabilization of phenoxide ion. Reactions of phenols-electrophilic aromatic substitution, acylation and carboxylation. Mechanisms of Fries rearrangement, Claisen rearrangement, Gatterman synthesis, and Reimer-Tiemann reaction. **UNIT-II (8 Hrs.)** **Aldehydes and Ketones I** Nomenclature and structure of the carbonyl group. Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes from acid chorides, synthesis of aldehydes and ketones using 1,3-dithianes, synthesis of ketones from nitriles and from carboxylic acids. Physical properties. **UNIT-III (7 Hrs.)** **Aldehydes and Ketones-II** Mechanism of nucleophilic additions to carbonyl group with particular emphasis on benzoin, aldol, Perkin and Knoevenagel condensations. Condensation with ammonia and its derivatives. Wittig reaction, Mannich reaction. Use of acetals as protecting group. Oxidation of aldehydes, Baeyer-Villiger oxidation of ketones, Cannizzaro reaction, MPV, Clemmensen, Wolff-Kishner, $LiAlH_4$ and $NaBH_4$ reductions.
					IV^{th}	Monohydric alcohols-Nomenclature, methods of formation by reduction of aldehydes, ketones, carboxylic acids and esters	
				August	I^{st}	Hydrogen bonding. Acidic nature. Reactions of alcohols. Dihydric and Trihydric alcohols-Nomenclature, methods of formation, chemical reactions of vicinal glycols and glycerol.	
					II^{nd}	Preparation of phenols, physical properties and acidic character. Comparative acidic	

						strengths of alcohols and phenols, resonance stabilization of phenoxide ion	**UNIT-IV** **Carboxylic Acids: (7 Hrs.)** Nomenclature, structure and bonding, physical properties, acidity of carboxylic acids, effects of substitutions on acid strength. Preparations of carboxylic acids. Reactions of carboxylic acids. Hell-Volhard-Zelinsky reaction. Synthesis of acid chlorides, esters and amides, Reduction of carboxylic acids. Mechanism of decarboxylation. Methods of formation and chemical reactions of halo acids. Hydroxyl acids: Malic, tartaric and citric acids(structural features only). Methods of formation and chemical reactions of unsaturated monocarboxylic acids. Dicarboxylic acids: Methods of formation and effects of heat and hydrating agents.
					III[rd]	Reactions of phenols-electrophilic aromatic substitution, acylation and carboxylation. Mechanisms of Fries rearrangement	
					IV[th]	Claisen rearrangement, Gatterman synthesis, and Reimer-Tiemann reaction.	
				September	I[st]	**UNIT-II** **Aldehydes and Ketones I** Nomenclature and structure of the carbonyl group. Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes from acid chorides,	
					II[nd]	Synthesis of aldehydes and ketones using 1,3-dithianes, synthesis of ketones from nitriles and from carboxylic acids, Physical properties.	
					III[rd]	**UNIT-III** **Aldehydes and Ketones-II** Mechanism of	

						nucleophilic additions to carbonyl group with particular emphasis on benzoin, aldol, Perkin and Knoevenagel condensations.	
					IVth	Condensation with ammonia and its derivatives. Wittig reaction, Mannich reaction. Use of acetals as protecting group	
					Vth	Oxidation of aldehydes, Baeyer-Villiger oxidation of ketones, Cannizzaro reaction, MPV, Clemmensen, Wolff-Kishner, $LiAlH_4$ and $NaBH_4$ reductions.	
				October	**AUTUMN BREAK**		
					IInd	**UNIT-IV** **Carboxylic Acids:** Nomenclature, structure and bonding, physical properties, acidity of carboxylic acids, effects of substitutions on acid strength.	
					IIIrd	Preparations of carboxylic acids. Reactions of carboxylic acids. Hell-Volhard-Zelinsky reaction	
					IVth	Synthesis of acid chlorides, esters and amides, Reduction of carboxylic acids.	

				November	Ist	Mechanism of decarboxylation. Methods of formation and chemical reactions of halo acids. Hydroxyl acids: Malic, tartaric and citric acids (structural features only).	
					IInd	Methods of formation and chemical reactions of unsaturated monocarboxylic acids. Dicarboxylic acids: Methods of formation and effects of heat and hydrating agents.	
3.	Prof. Manpreet Kaur	B.Sc.-II	Paper-IX Inorganic Chemistry-A	July	IIIrd	**UNIT-I** **Chemistry of Elements of First Transition Series:** Characteristic properties of *d*-block elements.	**UNIT-I (8 Hrs.)** **Chemistry of Elements of First Transition Series:** Characteristic properties of *d*-block elements. Properties of the elements of the first transition series, their simple compounds and complexes, illustrating relative stability of their oxidation states, coordination number and geometry. **UNIT-II (7 Hrs.)** **Chemistry of Elements of Second and Third Transition Series:** General characteristics, comparative treatment with their 3*d*-analogues in respect of ionic radii, oxidation states, magnetic behaviour, spectral properties and stereochemistry. **UNIT-III (8 Hrs.)** **Chemistry of Coordination Compounds-I** Werner's coordination theory and its experimental verification, effective atomic number concept, chelates, nomenclature of coordination compounds, isomerism in coordination compounds **UNIT-IV (7 Hrs.)** **Chemistry of Coordination Compounds-II** Valence bond theory of transition metal complexes. Properties of Coordination compounds i.e. magenetic properties, colours (Qualitative approach only), use of coordination compounds.
					IVth	Properties of the elements of the first transition series, their simple compounds and complexes, illustrating relative stability of their oxidation states, coordination number and geometry.	
				August	Ist	Properties of the elements of the first transition series, their simple compounds and complexes, illustrating relative stability of their	

						oxidation states, coordination number and geometry.	
					IInd	Properties of the elements of the first transition series, their simple compounds and complexes, illustrating relative stability of their oxidation states, coordination number and geometry.	
					IIIrd	**UNIT-II** **Chemistry of Elements of Second and Third Transition Series:** General characteristics	
					IVth	Comparative treatment with their 3*d*-analogues in respect of ionic radii, oxidation states, magnetic behaviour, spectral properties and stereochemistry.	
					Vth	Comparative treatment with their 3*d*-analogues in respect of ionic radii, oxidation states, magnetic behaviour, spectral properties and stereochemistry.	
				September	IInd	**UNIT-III** **Chemistry of Coordination Compounds-I** Werner's coordination theory and its experimental	

						verification	
					III[rd]	Effective atomic number concept, chelates,	
					IV[th]	Isomerism in coordination compounds	
					V[th]	Isomerism in coordination compounds	
				October	**AUTUMN BREAK**		
					II[nd]	**UNIT-IV Chemistry of Coordination Compounds-II** Valence bond theory of transition metal complexes	
					III[rd]	Properties of Coordination compounds i.e. magenetic properties, colours (Qualitative approach only),	
					IV[th]	Properties of Coordination compounds i.e. magenetic properties, colours (Qualitative approach only),	
					V[th]	Properties of Coordination compounds i.e. magenetic properties, colours (Qualitative approach	

						only),	

BACHELOR OF SCIENCESession 2017-2018(Fifth Semester)							
S.No.	Teacher	Class	Paper	Month	Week		Syllabus
1.	Prof. Jyoti	B.Sc.-III	Paper-XVII Inorganic Chemistry-A	July	III[rd]	UNIT-I **Metal – Ligand Bonding in Transition Metal Complexes**: Limitations of valence bond theory, an elementary idea of crystal – field theory	UNIT-I (8 Hrs.) **Metal – Ligand Bonding in Transition Metal Complexes**: Limitations of valence bond theory, an elementary idea of crystal – field theory, crystal field splitting in octahedral, tetrahedral and square planar complexes, factors affecting the crystal – field parameters, Spectro chemical Series. UNIT-II (7 Hrs.) **Thermodynamic and Kinetic Aspects of Metal Complexes** : A brief outline of thermodynamic and Kinetic stability of metal complexes and factors affecting the stability, substitution reactions of square planar complexes. UNIT-III (8 Hrs.) **Organometallic Chemistry**: Definition, nomenclature and classification of organometallic compounds. Preparation, properties, bonding and applications of alkyls and aryls of Li, Al , Hg, Sn and Ti, a brief account of metal – ethylenic complexes and homogeneous hydrogenation, mononuclear carbonyls and the nature of bonding in metal carbonyls UNIT-IV (7 Hrs.) **Bioinorganic Chemistry**: Essential and trace elements in biological processes, metalloporphyrins with special reference to haemoglobin and myoglobin. Biological role of alkali and alkaline earth metal ions. Nitrogen fixation.
					IV[th]	Crystal field splitting in octahedral complexes	
				August	I[st]	Crystal field splitting in tetrahedral complexes	
					II[nd]	Crystal field splitting in square planar complexes, factors affecting the crystal – field parameters, Spectro chemical Series.	
					III[rd]	UNIT-II **Thermodynamic and Kinetic Aspects of Metal Complexes** : A brief outline of thermodynamic and Kinetic stability of	

						metal complexes	
					IVth	Factors affecting the stability square planar complexes	
					Vth	Factors affecting the substitution reactions of square planar complexes	
				September	IInd	UNIT-III **Organometallic Chemistry**: Definition, nomenclature and classification of organometallic compounds.	
					IIIrd	Preparation, properties, bonding and applications of alkyls and aryls of Li, Al	
					IVth	Preparation, properties, bonding and applications of alkyls and aryls of Hg, Sn and Ti,	
					Vth	A brief account of metal – ethylenic complexes and homogeneous hydrogenation,	
				October	**AUTUMN BREAK**		

					II[nd]	Mononuclear carbonyls and the nature of bonding in metal carbonyls	
					III[rd]	UNIT-IV **Bioinorganic Chemistry**: Essential and trace elements in biological processes	
					IV[th]	Metalloporphyrins with special reference to haemoglobin and myoglobin.	
					V[th]	Biological role of alkali and alkaline earth metal ions.	
				November	Ist	Nitrogen fixation.	
2.	Prof. Manpreet Kaur	B.Sc-III	Paper-XVIII Organic chemistry-A	July	III[rd]	UNIT-III **Spectroscopy**: Nuclear magnetic resonance (NMR) spectroscopy. Proton magnetic resonance (^{1}H NMR) spectroscopy,	**UNIT-I** (7 Hrs.) **Heterocyclic Compounds**: Introduction : Molecular orbital picture and aromatic character of pyrrole, furan, thiophene and pyridine. Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution. Mechanism of nucleophilic substitution reactions in pyridine derivatives. Comparison of basicity of pyridine, piperidine and pyrrole. Introduction to condensed – five and six – membered heterocycles. Preparation and reactions of indole, quinoline and isoquinoline with special reference to Fisher indole synthesis. Skraup synthesis and Bischler-– Napieralski synthesis. Mechanism of electrophilic substitution reactions of indole, quinoline and isoquinoline. UNIT-II (7 Hrs.) **Electromagnetic Spectrum: Absorption Spectra-II**: Infrared (IR) absorption spectroscopy – Molecular vibrations, Hooke's law, selection rules, intensity and position of IR bands, measurement of IR spectrum, fingerprint region, characteristic absorptions of various functional groups and interpretation of IR spectra of simple organic compounds. Problems pertaining to the structure elucidation of simple organic compounds using UV, IR and PMR spectroscopic techniques. UNIT-III (8 Hrs.) **Spectroscopy**:
					IV[th]	Nuclear shielding and deshielding, chemical shift and molecular structure,	
				August	I[st]	Spin-spin splitting and coupling constants, area of signals	
					II[nd]	Interpretation of PMR spectra	
					III[rd]	Interpretation of	

						ethyl bromide, ethanol, acetaldehyde, 1,1,2-tribromoethane, ethyl acetate, toluene and acetophenone.	Nuclear magnetic resonance (NMR) spectroscopy. Proton magnetic resonance (^{1}H NMR) spectroscopy, nuclear shielding and deshielding, chemical shift and molecular structure, spin-spin splitting and coupling constants, area of signals, interpretation of PMR spectra of simple organic molecules such as ethyl bromide, ethanol, acetaldehyde, 1,1,2-tribromoethane, ethyl acetate, toluene and acetophenone. UNIT-IV (8 Hrs.) **Carbohydrates**: Classification and nomenclature. Monosaccharides, mechanism of osazone formation, interconversion of glucose and fructose, chain lengthening and chain shortening of aldoses. Configuration of monosaccharides. Erythro and threo diastereomers. Conversion of glucose into mannose. Formation of glycosides, ethers and esters. Determination of ring size of monosaccharides. Cyclic structure of D (+) – glucose. Mechanism of mutarotation. Structure of ribose and deoxyribose. An introduction to disaccharides (maltose, sucrose and lactose) and polysaccharides (starch and cellulose) without involving structure determination.
					IVth	Applications of NMR	
				September	Ist	UNIT-II **Electromagnetic Spectrum: Absorption Spectra-II**: Infrared (IR) absorption spectroscopy – Molecular vibrations, Hooke's law, selection rules	
					IInd	Intensity and position of IR bands, measurement of IR spectrum, fingerprint region,	
					IIIrd	Characteristic absorptions of various functional groups and interpretation of IR spectra of simple organic compounds	
					IVth	Problems pertaining to the structure elucidation of simple organic compounds using UV, IR and PMR spectroscopic techniques.	
					Vth	UNIT-IV	

						Carbohydrates: Classification and nomenclature. Monosaccharides	
				October	**AUTUMN BREAK**		
					II[nd]	Mechanism of osazone formation, interconversion of glucose and fructose, chain lengthening and chain shortening of aldoses. Configuration of monosaccharides. Erythro and threo diastereomers	
					III[rd]	Conversion of glucose into mannose. Formation of glycosides, ethers and esters. Determination of ring size of monosaccharides. Cyclic structure of D (+) – glucose. Mechanism of mutarotation. Structure of ribose and deoxyribose	
					IV[th]	An introduction to disaccharides (maltose, sucrose and lactose) and polysaccharides (starch and cellulose) without involving structure	

						determination. UNIT-I **Heterocyclic Compounds**: Introduction : Molecular orbital picture	
				November	Ist	Aromatic character of pyrrole, furan, thiophene and pyridine. Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution. Mechanism of nucleophilic substitution reactions in pyridine derivatives. Comparison of basicity of pyridine, piperidine and pyrrole.	
					IInd	Introduction to condensed – five and six – membered heterocycles. Preparation and reactions of indole, quinoline and isoquinoline with special reference to Fisher indole synthesis. Skraup synthesis and	

						Bischler-– Napieralski synthesis. Mechanism of electrophilic substitution reactions of indole, quinoline and isoquinoline.	
3.	Dr. Gurpreet Kaur	B.Sc.-III	Paper-XIX Physical Chemistry-A	July	IIIrd	**UNIT-I Elementary Quantum Mechanics-I**: Black-body radiation, Planck's radiation law, photoelectric effect,	**UNIT-I (8 Hrs.)** **Elementary Quantum Mechanics-I**: Black-body radiation, Planck's radiation law, photoelectric effect, heat capacity of solids, Bohr's model of hydrogen atom (no derivation) and its defects, Compton effect. De Broglie hypothesis, the Heisenberg's uncertainty principle, Sinusoidal wave equation, Hamiltonian operator, Schrodinger wave equation and its importance, physical interpretation of the wave function, postulates of quantum mechanics, particle in a one dimensional box. Schrodinger wave equation for H-atom, separation into three equations (without derivation), quantum numbers and their importance, hydrogen like wave functions, radial wave functions, angular wave functions. **UNIT-II** (7 Hrs.) **Elementary Quantum Mechanics-II**: Molecular orbital theory, basic ideas – criteria for forming M.O. from A.O., construction of M.O.'s by LCAO – H_2^+ ion. Calculation of energy levels from wave functions, physical picture of bonding and antibonding wave functions, concept of σ, σ*, π, π* orbitals and their characteristics. Hybrid orbitals – sp, sp^2, sp^3; calculation of coefficients of A.O.'s used in these hybrid orbitals. Introduction to valence bond model of H_2, comparison of M.O. and V.B. models. **UNIT-III** (8 Hrs.) **Photochemistry-I**: Interaction of radiation with matter, difference between thermal and photochemical processes. Laws of Photochemistry: Grothus – Drapper law, Stark – Einstein law, Jablonski diagram depicting various processes occurring in the excited state. **UNIT-IV** (7 Hrs.) **Photochemistry-II**: Qualitative description of fluorescence, phosphorescence, non-radiative processes (internal conversion, intersystem crossing), quantum yield, photosensitized reactions – energy transfer processes (simple examples).Photochemistry of carbonyl compounds and alkenes.
					IVth	Heat capacity of solids, Bohr's model of hydrogen atom (no derivation) and its defects, Compton effect. De Broglie hypothesis,	
				August	Ist	The Heisenberg's uncertainty principle, Sinusoidal wave equation, Hamiltonian operator, Schrodinger wave equation and its importance,	
					IInd	Physical interpretation of the wave function, postulates of quantum mechanics, particle in a one dimensional box.	

					III[rd]	Schrodinger wave equation for H-atom, separation into three equations (without derivation), quantum numbers and their importance,	
					IV[th]	Hydrogen like wave functions, radial wave functions, angular wave functions.	
					V[th]	**UNIT-II Elementary Quantum Mechanics-II**: Molecular orbital theory, basic ideas – criteria for forming M.O. from A.O.,	
				September	II[nd]	Construction of M.O.'s by LCAO – H_2^+ ion. Calculation of energy levels from wave functions, physical picture of bonding and antibonding wave functions,	
					III[rd]	Concept of σ, σ*, π, π* orbitals and their characteristics. Hybrid orbitals – sp, sp^2, sp^3; calculation of coefficients of A.O.'s used in these hybrid orbitals.	

					IVth	Introduction to valence bond model of H_2, comparison of M.O. and V.B. models. **UNIT-III** **Photochemistry-I**: Interaction of radiation with matter	
					Vth	Difference between thermal and photochemical processes. Laws of Photochemistry: Grothus – Drapper law, Stark – Einstein law,	
				October	Autumn Break		
					IInd	Jablonski diagram depicting various processes occurring in the excited state.	
					IIIrd	**UNIT-IV** **Photochemistry-II**: Qualitative description of fluorescence, phosphorescence, non-radiative processes (internal conversion, intersystem crossing)	
					IVth	Quantum yield, photosensitized reactions – energy transfer processes (simple examples).	
					Vth	Photochemistry of	

						carbonyl compounds and alkenes.	

MASTER OF SCIENCE Session 2017-2018(First Semester)							
S.No.	**Teacher**	**Class**	**Paper**	**Month**	**Week**		**Syllabus**
1.	Dr. Geeta Jallan	M.Sc.-I	CH-411 Inorganic Chemistry-I	August	Ist	**UNIT1 Stereochemistry And Bonding In Main Group Compounds** VSEPR, Walsh diagrams (tri and tetra-molecules), dπ-pπ bonds, Bent rule	**UNIT 1 (15 Hrs.)** **Stereochemistry And Bonding In Main Group Compounds** VSEPR, Walsh diagrams (tri and tetra-molecules), dπ-pπ bonds, Bent rule and energetics of hybridization, some simple reactions of covalently bonded molecules. **UNIT 2 (15 Hrs.)** **Metal Ligand Bonding** Limitations of crystal field theory, molecular orbital theory, octahedral, tetrahedral and square planar complexes, π bonding and molecular orbital theory. **UNIT 4 (15Hrs)** **Reaction Mechanism of Transition Metal Complexes –II** Acid hydrolysis, factors affecting acid hydrolysis, base hydrolysis, conjugate base mechanism, direct and indirect evidences in favour of conjugate mechanism, reactions without metal-ligand bond cleavage. Substitution reactions in square planar complexes, the trans effect, mechanism of substitution reaction, Redox reactions, electron transfer reactions, mechanism of one electron transfer reactions, outer sphere type reactions, cross reactions and Marcus Hush Theory, inner sphere type
					IInd	Energetics of hybridization, some simple reactions of covalently bonded molecules	
					IIIrd	**UNIT 2** **Metal Ligand Bonding** Limitations of crystal field theory,	
					IVth	Molecular orbital theory, octahedral,	
					Vth	Tetrahedral**,** Square planar complexes,	
				September	Ist	π bonding and molecular orbital theory	

					II[nd]	**Unit IV** **Reaction Mechanism of Transition Metal Complexes – II** Acid hydrolysis,	reactions.
					III[rd]	Factors affecting acid hydrolysis,	
					IV[th]	Base hydrolysis, conjugate base mechanism,	
				October	**AUTUMN BREAK**		
					II[nd]	Reactions without metal-ligand bond cleavage Substitution reactions in square planar complexes,	
					III[rd]	The trans effect, mechanism of substitution reaction Redox reactions,	
					IV[th]	Electron transfer reactions, mechanism of one electron transfer reactions	
					V[th]	Outer sphere type reactions, cross reactions	
				November	I[st]	Marcus Hush Theory	
					II[nd]	Inner sphere type reactions.	
2.	Prof. Jyoti	M.Sc-I	CH-411 Inorganic Chemistry-I	August	Ist	**UNIT 3** **Metal-Ligand Equilibria In Solution** Stepwise and overall formation constant	**UNIT3 (15Hrs.)** **Metal-Ligand Equilibria In Solution** Stepwise and overall formation constant and their interaction, trends in stepwise constants, factors affecting the stability of metal complexes with reference to the nature of metal ion and ligand, chelate effect and its thermodynamic origin, determination of binary formation constants by pH spectrophotometry. **Reaction Mechanism of Transition Metal Complexes-I** Energy profile of a reaction, reactivity of metal complexes, inert and labile complexes, kinetic application of valance bond and crystal field theories, kinetics of octahedral substitution.
					II[nd]	Interaction trends in stepwise constants	
					III[rd]	Factors affecting the stability of metal complexes	
					IV[th]	Reference to the nature of metal ion and ligand	
					V[th]	Chelate effect	
				September	I[st]	Thermodynamic origin of chelate efffect	

					II[nd]	Determination of binary formation constants	
					III[rd]	Using pH spectrophotometry.	
					IV[th]	**Reaction Mechanism of Transition Metal Complexes-I** Energy profile of a reaction	
				October		**AUTUMN BREAK**	
					II[nd]	Reactivity of metal complexes,Inert and labile complexes	
					III[rd]	Kinetic application of valance bond theory	
					IV[th]	Kinetic application of crystal field theories	
				November	I[st]	Kinetics of octahedral substitution.	
2.	Dr. Arvinder Kaur	M.Sc-I	CH-412 Organic chemistry-II	August	I[st]	UNIT 3 Aliphatic Nucleophilic Substitution The SN2, SN1	UNIT 3 (10 Hrs.) Aliphatic Nucleophilic Substitution The SN2, SN1, mixed SN1 and SN2 and SET mechanisms. Theneighbouring group mechanism, neighbouring group participation by π and σ bonds, Classical and non-classical carbocations, norbornyl system. common carbocation rearrangements. The SNi mechanism. Nucleophilic substitution at an allylic, aliphatic, trigonal and a vinylic carbon. Reactivity effects of substrate structure, attacking nucleophile, leaving group and reaction medium, phase transfer catalysis, ambident nucleophile, regioselectivity. UNIT 4 (8 Hrs.) Aromatic Electrophilic Substitution The arenium ion mechanism, orientation and reactivity, energy profile diagrams. The ortho/para ratio, ipso attack, orientation in other ring systems. Quantitative treatment of reactivity in substrates and electrophiles. Diazonium coupling, Vilsmeyer reaction, Gattermann-Koch reaction.
					II[nd]	Mixed SN1 and SN2, SET mechanisms.	
					III[rd]	The neighbouring group mechanism,Neighbouring group participation by π and σ bonds,	
					IV[th]	Classical and non-classical carbocations	
					V[th]	Norbornyl system. common carbocation rearrangements	
				September	I[st]	The SNi mechanism. Nucleophilic substitution at an allylic, aliphatic	
					II[nd]	Trigonal and a vinylic carbon. Reactivity effects of substrate structure,	
					III[rd]	Attacking nucleophile, leaving	

						group and reaction medium,	
					IVth	Phase transfer catalysis ambident nucleophile, regioselectivity.	
				October	**AUTUMN BREAK**		
					IInd	UNIT 4 Aromatic Electrophilic Substitution The arenium ion mechanism orientation and reactivity, Energy profile diagrams.	
					IIIrd	The ortho/para ratio, ipso attack, Orientation in other ring systems.	
					IVth	Quantitative treatment of reactivity in substrates	
					Vth	Diazonium coupling	
				November	Ist	Vilsmeyer reaction	
					IInd	Gattermann-Koch reaction.	
3.	Dr. Gurpreet	M.Sc.-I	CH-412 Organic chemistry-II	August	Ist	UNIT 1 Nature of Bonding in Organic Molecule Delocalized chemical bonding, conjugation	UNIT 1 Nature of Bonding in Organic Molecule (15 Hrs.) Delocalized chemical bonding, conjugation, Cross conjugation, resonance hyper conjugation, Bonding in fullerenes, Tautomerism, Aromaticity in benzenoid and non benzenoid compd. Alternant and non alternant hydrocarbons, Huckel's rule. Energy level of π M.O., Annulenes, anti aromaticity, aromaticity, Homo aromaticity, PMO approach. Bonds weaker than covalent, addition compound, crown ether complexes and cryptands, Inclusion compound, cyclo dextrins, Catenanes & rotaxanes. Effect of structure on reactivity-resonance and field effects, steric effect, quantitative treatment. The Hammett equation and linear free energy relationship, substituent and reaction constants. Taft equation. UNIT 2 (15 Hrs.) Stereochemistry Conformational analysis of cyclo alkanes, decalins, effect of confirmation on reactivity. Confirmation of sugars, Steric strain due to undesirable crowding of resolution, entatiotropic and diasterotropic atoms. Stereo specific and stereo selective synthesis, chirality due to helical shape. Stereochemistry of compounds containing N,S,P. UNIT 4 (7Hrs.)
					I^{Ind}	Cross conjugation, resonance hyper conjugation,	
					IIIrd	Bonding in fullerenes, Tautomerism, Aromaticity in benzenoid and non benzenoid compd.	
					IVth	Alternant and non alternant hydrocarbons, Huckel's rule.	
					Vth	Energy level of π M.O., Annulenes, anti aromaticity, aromaticity, Homo aromaticity,	
				September	Ist	PMO approach. Bonds weaker than covalent, addition compound, crown ether complexes	

					II[nd]	Cryptands, Inclusion compound, cyclo dextrins, Catenanes & rotaxanes	Aromatic Nucleophilic Substitution The SNAr, SN1, benzyne and SRN1 mechanisms, Reactivity-effect of substrate structure, leaving group and attacking nucleophile. The Von Richter, Sommelet-Hauser and smiles rearrangements.
					III[rd]	Effect of structure on reactivity-resonance and field effects, steric effect, quantitative treatment	
					IV[th]	The Hammett equation and linear free energy relationship, substituent and reaction constants. Taft equation.	
				October	**AUTUMN BREAK**		
					II[nd]	UNIT 2 Stereochemistry Conformational analysis of cyclo alkanes, decalins, effect of confirmation on reactivity. Confirmation of sugars, Steric strain due to undesirable crowding of resolution, entatiotropic	
					III[rd]	Diasterotropic atoms. Stereo specific and stereo selective synthesis, chirality due to helical shape.	
					IV[th]	Stereochemistry of compounds containing N,S,P. UNIT 4 Aromatic Nucleophilic Substitution The SNAr, SN1	
				November	I[st]	Benzyne and SRN1 mechanisms, Reactivity-effect of substrate structure, leaving group	
					II[nd]	Attacking nucleophile. The Von Richter, Sommelet-Hauser and smiles rearrangements.	

4.	Prof. Manpreet Kaur	M.Sc-I	CH-413 Physical Chmistry-I	August	Ist	**UNIT 1** **Quantum Chemistry** Application of Schrodinger wave equation to particle in three dimensional box	**UNIT 1 (15 Hrs.)** **Quantum Chemistry** Application of Schrodinger wave equation to particle in three dimensional box, simple harmonic oscillator and rigid rotator. Approximate Methods: The variation theorem, Linear variation Principle, perturbation theory (first order, second order and Non degenerate), Applications of variation method and perturbation theory to the Helium atom. Self-Consistent-Field theory. **UNIT 2 (15 Hrs.)** **Angular Momentum:** Ordinary ang. momentum, generalized angular momentum, eigen functions for angular momentum, eigen values of angular momentum, operator using ladder operators, addition of angular-momenta, spin, anti symmetry and Pauli exclusion principle. **Molecular Orbital Theory :** Huckel theory of conjugated systems, bond order and charge density calculations, application to ethylene, allyl, butadiene, cyclopropenyl system, cylobutadiene etc.
					IInd	Simple harmonic oscillator and rigid rotator.	
					IIIrd	Approximate Methods: The variation theorem, Linear variation Principle	
					IVth	Perturbation theory (first order)	
				September	Ist	Second order and Non degenerate	
					IInd	Applications of variation method to the Helium atom	
					IIIrd	Applications of perturbation theory to the Helium atom	
					IVth	Self-Consistent-Field theory	
				October	**AUTUMN BREAK**		
					IInd	**UNIT 2** **Angular Momentum:** Ordinary ang. momentum, generalized angular momentum, eigen functions for angular momentum, eigen values of angular momentum,	
					IIIrd	Operator using ladder operators, addition of angular-momenta,	
					IVth	Spin, anti symmetry and Pauli exclusion principle.	
					Vth	**Molecular Orbital Theory :** Huckel theory of conjugated systems, bond order and charge density calculations,	
				November	Ist	Application to ethylene, allyl, butadiene,	
					IInd	Application to cyclopropenyl	

						system, cylobutadiene etc.	
4.	Prof. Sunny	M.Sc-I	CH-413 Physical Chmistry-I	August	Ist	**UNIT 3** **Thermodynamics:** Classical Thermodynamics: Partial molal proporties, partial molal free energy,	**UNIT 3 (15 Hrs.)** **Thermodynamics:** Classical Thermodynamics: Partial molal proporties, partial molal free energy, volume & heat content and their significance, Determination of these quantities, concept of fugacity and determination of fugacity. Non ideal systems, excess functions for non ideal solutions, Activity, Activity coeff, Debye huckel theory for activity coeff. electrolyte solutions, determination of activity & activity coeff, ionic strength. Application of phase rule to 3-component system, second order phase transitions. Statistical Thermodynamics: Concept of distribution, thermodynamic probability & most probable distribution, ensemble averaging, postulates of ensemble averaging, canonical, grand canonical & micro canonical ensembles. **UNIT 4 (15 Hrs.)** **Statistical Thermodynamics:** Corresponding distribution laws (using Lagrange's method of undetermined multipliers) Partition functions: Translational, Rotational, Vibrational, Electronic partitions functions. Calculation of Thermodynamic properties in terms of partition functions. Heat capacity, behavior of solids chemical equilibria and equilibrium constant in terms of partition function, F.D. statistics,distribution law and application to metals. Bose Einsteins statistics. Distribution law & application to Helium**.**
					IInd	Volume & heat content and their significance, Determination of these quantities, concept of fugacity	
					IIIrd	Determination of fugacity.	
					IVth	Non ideal systems, excess functions for non ideal solutions, Activity, Activity coeff,	
				September	Ist	Debye huckel theory for activity coeff. electrolyte solutions, determination of activity & activity coeff, ionic strength.	
					IInd	Application of phase rule to 3-component system, second order phase transitions.	
					IIIrd	Statistical Thermodynamics: Concept of distribution, thermodynamic probability & most probable distribution,	
					IVth	Ensemble averaging, postulates of ensemble averaging, canonical, grand canonical & micro canonical ensembles.	
				October	**AUTUMN BREAK**		
					IInd	**UNIT 4** **Statistical Thermodynamics:** Corresponding distribution laws (using Lagrange's method of undetermined multipliers) Partition functions: Translational,	

						Rotational,Vibrational, Electronic partitions functions.	
					IIIrd	Calculation of Thermodynamic properties in terms of partition functions. Heat capacity, behavior of solids chemical equilibria,	
					IVth	equilibrium constant in terms of partition function	
					Vth	F.D. statistics,distribution law and application to metals.	
				November	Ist	Bose Einsteins statistics. Distribution law &	
					IInd	Its application to Helium.	

<u>End Semester</u> **02-12-17** **To** **21-12-17** **(17 days including**

Examinations	**Saturday**		**Thursday**	**Saturday)**
Semester Vacation	**22-12-17**	**To**	**07-01-18**	**(17days)**
(Winter Break)	**Friday**		**Sunday**	

Academic Term –II

2nd& 4th& 6th semester

Even Semesters

College reopens after	**08-01-18To**	**10-05-18(96 teaching**	
Semester Examination	**Monday**	**Thursdaydays)**	

Total teaching days of Academic Term II= 96 days

BACHELOR OF SCIENCESession 2017-2018(Second Semester January-May)							
S.No.	Teacher	Class	Paper	Month	Week		Syllabus
1.	Prof. Sunny	B.Sc.-I	Paper-VII Physical Chemistry-B	January	II[nd]	**UNIT-I Thermodynamics-I:** *Definition of Thermodynamic Terms*: System, surroundings etc. Types of systems, intensive and extensive properties.	**UNIT-I (8 Hrs.)** **Thermodynamics-I:** *Definition of Thermodynamic Terms*: System, surroundings etc. Types of systems, intensive and extensive properties. State and path functions and their differentials. Thermodynamic process. Concept of heat and work. *First Law of Thermodynamics*: Statement, definition of internal energy and enthalpy, Heat capacity, heat capacities at constant volume and pressure and their relationship. Joule's Law-Joule-Thomson coefficient and inversion temperature. Calculations of w, q, dU & dH for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process. **UNIT-II (7 Hrs.)** ***Thermochemistry:*** Standard state, standard enthalpy of formation-Hess's Law of constant Heat Summation and its applications. Heat of reaction at constant pressure and at constant volume. Enthalpy of neutralization. Bond dissociation energy and its calculation from thermo-chemical data, temperature dependence of enthalpy. Kirchoff's equation. **UNIT- III (7 Hrs.)** **Colloidal State:** Definition of colloids, classification of colloids. *Solids in liquids (sols):* Properties –kinetic, optical and electrical; stability of colloids, protective action, Hardy-Schulze rules, gold number. *Liquids in liquids (emulsions):* Types of emulsions, preparation. Emulsifier. *Liquids in solids (gels):* Classification, preparation and properties, inhibition, general applications of colloids. **UNIT-IV (8 Hrs.)** **Solutions, Dilute Solutions and Colligative Properties:** Ideal and non-ideal solutions, methods of expressing concentrations of solutions, activity and activity coefficient. Dilute solution, colligative properties, Raoult's law, relative lowering of vapour pressure, molecular weight determination. Osmosis, law of osmotic pressure and its measurement, determination of molecular weight from osmotic pressure. Elevation of boiling point and depression of freezing point. Thermodynamic derivation of relation between molecular weight and elevation in boiling point and depression of freezing point. Experimental methods for determining various colligative properties. Abnormal molar mass, degree of dissociation and association of solutes.
					III[rd]	State and path functions and their differentials Thermodynamic process. Concept of heat and work. *First Law of Thermodynamics*: Statement, definition of internal energy and enthalpy, Heat capacity, heat capacities at constant volume and pressure and their relationship	
					IV[th]	Joule's Law-Joule-Thomson coefficient and inversion temperature. Calculations of w, q, dU & dH for the expansion of ideal gases under isothermal for reversible process	

					Vth	Joule's Law-Joule-Thomson coefficient and inversion temperature. Calculations of w, q, dU & dH for the expansion of ideal gases under adiabatic conditions for reversible process.	
				February	IInd	**UNIT-II** ***Thermochemistry:*** Standard state, standard enthalpy of formation-Hess's Law of constant Heat Summation and its applications.	
					IIIrd	Heat of reaction at constant pressure and at constant volume. Enthalpy of neutralization. Bond dissociation energy	
					IVth	Bond dissociation energy calculation from thermo-chemical data, temperature dependence of enthalpy. Kirchoff's equation.	

					Vth	**UNIT- III** **Colloidal State:** Definition of colloids, classification of colloids. *Solids in liquids (sols):* Properties – kinetic, optical and electrical.	
				March	IInd	Stability of colloids, protective action, Hardy- Schulze rules, gold number.	
					IIIrd	*Liquids in liquids (emulsions) :*Types of emulsions, preparation. Emulsifier	
					IVth	*Liquids in solids (gels):* Classification, preparation and properties, inhibition, general applications of colloids.	
					Vth	**UNIT-IV** **Solutions, Dilute Solutions and Colligative Properties:** Ideal and non-ideal solutions, methods of expressing concentrations of solutions, activity and activity Coefficient.	

				April	I[st]	Dilute solution, colligative properties, Raoult's law, relative lowering of vapour pressure, molecular weight determination.	
					II[nd]	Osmosis, law of osmotic pressure and its measurement, determination of molecular weight from osmotic pressure	
					III[rd]	Elevation of boiling point and depression of freezing point. Thermodynamic derivation of relation between molecular weight and elevation in boiling point and depression of freezing point.	
					IV[th]	Experimental methods for determining various colligative properties. Abnormal molar mass, degree of dissociation and association of solutes.	
2.	Prof. Ruchika	B.Sc-I	Paper-VI Organic	January	II[nd]	**UNIT-I Alkenes,**	**UNIT-I (8 Hrs.)** **Alkenes, Cycloalkenes** :

			chemistry-B			**Cycloalkenes** : Nomenclature of alkenes, methods of formation, mechanisms of dehydration of alcohols and dehydrohalogenation of alkyl halides, regioselectivity in alcohol dehydration	Nomenclature of alkenes, methods of formation, mechanisms of dehydration of alcohols and dehydrohalogenation of alkyl halides, regioselectivity in alcohol dehydration. The Saytzeff's Rule, Hofmann elimination, physical properties and relative stabilities of alkenes. Chemical reactions of alkenes – mechanisms involved in hydrogenation, electrophilic and free radical additions, Markownikoff's rule, hydroboration – oxidation, oxymercuration-reduction. Epoxidation, ozonolysis, hydration, hydroxylation and oxidation with KMnO4. Polymerization of alkenes. Substitution at the allylic and vinylic positions of alkenes. Industrial applications of ethylene and propene. **UNIT-II (7 Hrs.)** **Dienes and Alkynes :** Methods of formation, conformation and chemical reactions of cycloalkenes. Nomenclature and classification of dienes : Isolated, conjugated and cumulated dienes. Structure of allenes and butadiene, methods of formation, polymerization. Chemical reactions – 1,2 and 1,4 additions, Diels-Alder reaction. Nomenclature, structure and bonding in alkynes. Methods of formation. Chemical reactions of alkynes, acidity of alkynes. Mechanism of electrophilic and nucleophilic addition reactions, hydroboration-oxidation, metal-ammonia reductions, oxidation and polymerization. **UNIT-III (8 Hrs.)** **Arenes and Aromaticity**: Nomenclature of benzene derivatives. The aryl group, Aromatic nucleus and side chain, Structure of benzene, Molecular formula and Kekule structure. Stability and carbon-carbon bond lengths of benzene, resonance structure, MO picture. Aromaticity : The Huckel rule, aromatic ions. Aromatic electrophilic substitution—General pattern of the mechanism, role of σ and π complexes. Mechanism of nitration, halogenation, sulphonation, mercuration and Friedel-Crafts reaction. Energy profile diagrams. Activating and deactivating substituents, orientation and ortho/para ratio. Side chain reactions of benzene derivatives. Methods of formation and chemical reactions of alkylbenzenes, alkynyl benzenes and biphenyl. **UNIT-IV (7 Hrs.)** **Alkyl and Aryl Halides** Nomenclature and classes of alkyl halides, methods of formation, chemical reactions. Mechanisms of nucleophilic substitution reactions of alkyl halides, SN2 and SN1 reactions with energy profile diagrams. Polyhalogen compounds : chloroform, carbon tetrachloride. Methods of formation of aryl halides, nuclear and side chain reactions. The addition-elimination and the elimination-addition mechanisms of nucleophilic aromatic substitution reactions. Relative relativities of alkyl halides vs. allyl, vinyl and aryl halides.
					IIIrd	The Saytzeff's Rule, Hofmann elimination, physical properties and relative stabilities of alkenes. Chemical reactions of alkenes – mechanisms involved in hydrogenation, electrophilic and free radical additions	
					IVth	Markownikoff's rule, hydroboration – oxidation, oxymercuration-reduction. Epoxidation, ozonolysis, hydration, hydroxylation and oxidation with KMnO4.	
				February	Ist	Polymerization of alkenes. Substitution at the allylic and vinylic positions of alkenes. Industrial applications of	

						ethylene and propene.	
					IInd	**UNIT-II** **Dienes and Alkynes :**Methods of formation, conformation and chemical reactions of cycloalkenes. Nomenclature and classification of dienes: Isolated, conjugated and cumulated dienes.	
					IIIrd	Structure of allenes and butadiene, methods of formation, polymerization. Chemical reactions – 1,2 and 1,4 additions, Diels-Alder reaction.	
					IVth	Nomenclature, structure and bonding in alkynes. Methods of formation. Chemical reactions of alkynes, acidity of alkynes	
				March	Ist	Mechanism of electrophilic and nucleophilic addition reactions, hydroboration-oxidation, metal-ammonia reductions, oxidation	

						and polymerization.	
					II[nd]	**UNIT-III Arenes and Aromaticity**: Nomenclature of benzene derivatives. The aryl group, Aromatic nucleus and side chain, Structure of benzene : Molecular formula and Kekule structure.	
					III[rd]	Stability and carbon-carbon bond lengths of benzene, resonance structure, MO picture. Aromaticity : The Huckel rule, aromatic ions.	
					IV[th]	Aromatic electrophilic substitution— General pattern of the mechanism, role of σ and π complexes. Mechanism of nitration, halogenation, sulphonation, mercuration and Friedel-Crafts reaction. Energy profile diagrams	
					V[th]	Activating and deactivating substituents,	

						orientation and ortho/para ratio. Side chain reactions of benzene derivatives. Methods of formation and chemical reactions of alkylbenzenes, alkynyl benzenes and biphenyl.	
				April	Ist	**UNIT-IV** **Alkyl and Aryl Halides** Nomenclature and classes of alkyl halides, methods of formation	
					IInd	Chemical reactions. Mechanisms of nucleophilic substitution reactions of alkyl halides, SN2 and SN1 reactions with energy profile diagrams.	
					IIIrd	Polyhalogen compounds: chloroform, carbon tetrachloride. Methods of formation of aryl halides, nuclear and side chain reactions.	
					IVth	The addition-elimination and the elimination-addition mechanisms of nucleophilic aromatic	

						substitution reactions. Relative relativities of alkyl halides vs. allyl, vinyl and aryl halides.	
3.	Prof. Jyoti	B.Sc.-I	Paper- V Inorganic Chemistry-B	January	IInd	**UNIT-I Chemical Bonding-II** Ionic Solids – Concept of close packing.	**UNIT-I (7 Hrs.)** **Chemical Bonding-II** Ionic Solids – Concept of close packing, Ionic structures, (NaCl type, Zinc blende, Wurtzite, CaF_2 and antifluorite), radius ratio rule and coordination number, limitation of radius ratio rule, lattice defects, semiconductors. **UNIT-II (8 Hrs.)** **Chemical Bonding-III** Lattice energy and Born-Haber cycle, solvation energy and solubility of ionic solids, polarizing power and polarisability of ions, Fajan's rule. Metallic bond-free electron, valence bond and band theories. Weak Interactions – Hydrogen bonding, Van der Waals forces. **UNIT-III (7 Hrs.)** ***p*-Block Elements-I** Comparative study (including diagonal relationship) of groups 13-14 elements, compounds like hydrides, oxides, oxyacids and halides of groups 13-14, hydrides of boron-diborane and higher boranes, borazine, borohydrides, fullerenes, carbides, fluorocarbons. **UNIT-IV (8 Hrs.)** ***p*-Block Elements-II** Comparative study of groups 15-17 elements, compounds like hydrides, oxides, oxyacids and halides of groups 15-17, silicates (structural principle), tetrasulphur tetranitride, basic properties of halogens, interhalogens and polyhalides.
					IIIrd	Ionic structures, (NaCl type, Zinc blende, Wurtzite, CaF_2 and antifluorite)	
					IVth	Radius ratio rule and coordination number, limitation of radius ratio rule, lattice defects, semiconductors.	
					Vth	**UNIT-II Chemical Bonding-III** Lattice energy and Born-Haber cycle	
				February	IInd	Solvation energy and solubility of ionic solids, polarizing power and polarisability of ions,	
					IIIrd	Fajan's rule. Metallic bond-free electron, valence bond and band theories.	
					IVth	Weak Interactions – Hydrogen bonding,	

						Van der Waals forces.	
					Vth	**UNIT-III** ***p*-Block Elements-I** Comparative study (including diagonal relationship) of groups 13-14 elements compounds like hydrides, oxides, oxyacids	
				March	IInd	Comparative study (including diagonal relationship) of groups 13-14 elements compounds like hydrides, oxides, oxyacids	
					IIIrd	Hydrides of boron-diborane and higher boranes, borazine, borohydrides,	
					IVth	Fullerenes, carbides,	
					Vth	Fluorocarbons	
				April	Ist	**UNIT-IV** ***p*-Block Elements-II** Comparative study of groups 15-17 elements, compounds like hydrides, oxides, oxyacids and halides of groups 15-17	
					IInd	Comparative study of groups 15-17 elements, compounds like hydrides, oxides, oxyacids and halides of groups 15-17	

					III[rd]	Halides of groups 15-17, silicates (structural principle	
					IV[th]	Tetrasulphur tetranitride basic properties of halogens, interhalogens and polyhalides.	

BACHELOR OF SCIENCE Session 2017-2018(Fourth Semester January-May)							
S.No.	Teacher	Class	Paper	Month	Week		Syllabus
1.	Prof. Sunny	B.Sc.-II	Paper-XV Physical Chemistry-B	January	II[nd]	**UNIT-I (8 Hrs.)** **Phase equilibrium:** Statement and meaning of the terms – phase, component and degree of freedom, derivation of Gibbs phase rule	**UNIT-I (8 Hrs.)** **Phase equilibrium:** Statement and meaning of the terms – phase, component and degree of freedom, derivation of Gibbs phase rule, phase equilibria of one component system—water, CO_2 and S systems. Phase equilibria of two component system –solid –liquid equilibria, simple eutectic – Bi-Cd system, desiliverisation of lead. Solid solutions—compound formation with congruent melting point (Mg-Zn) and incongruent melting point, (NaCl-H_2O) system. Freezing mixtures, acetone-dry ice. Partially Miscible Liquids –Phenol-water, trimethylamine – water, nicotine –water systems. Lower and upper consolute temperature. Effect of impurity on consolute temperature, immiscible liquids, steam distillation. Nernst distribution law-thermodynamic derivation, applications.
					III[rd]	Phase equilibria of one component system—water, CO2 and S systems.	
					IV[th]	Phase equilibria of two component system –solid –liquid equilibria, simple eutectic – Bi-Cd system, desiliverisation of lead.	**UNIT-II (7 Hrs.)** **Electrochemistry –I:** Electrical transport –Conduction in metals and in electrolyte solutions, specific conductance and equivalent conductance, measurement of equivalent conductance, variation of equivalent and specific conductance with dilution. Migration of ions and Kohlrausch Law, Arrhennius theory of electrolyte dissociation and its limitations, weak

					Vth	Solid solutions—compound formation with congruent melting point (Mg-Zn) and incongruent melting point, ($NaCl-H_2O$) system.	and strong electrolytes, Ostwald's dilution law, its uses and limitations. Debye-Huckel-Onsager's equation for strong electrolytes (elementary treatment only). Transport number, definition and determination by Hittorf method and moving boundary method. **UNIT-III (8 Hrs.)** **Electrochemistry-II:** Types of reversible electrodes – gas metal – ion, metal –insoluble salt – anion and redox electrodes. Electrode reactions, Nernst equation, derivation of cell E.M.F. and single electrode potential, standard hydrogen electrode – reference electrodes – standard electrode potential, sign conventions, electrochemical series and its significance. **UNIT-IV (7 Hrs.)** Electrolytic and Galvanic cells – reversible and irreversible cells, conventional representation of electrochemical cells. E.M.F. of a cell and its measurements. Computation of cell E.M.F. Calculation of thermodynamic quantities of cell reactions (ΔG, ΔH and K), Polarization, over potential and hydrogen overvoltage. Concentration cell with and without transport, liquid junction potential, application of concentration cells, valency of ions, solubility product and activity coefficient, potentiometric titrations.
				February	IInd	Freezing mixtures, acetone-dry ice.	
					IIIrd	Partially Miscible Liquids –Phenol-water, trimethylamine – water, nicotine –water systems.	
					IVth	Lower and upper consolute temperature. Effect of impurity on consolute temperature, immiscible liquids, steam distillation.	
					Vth	Nernst distribution law-thermodynamic derivation, applications	
				March	IInd	**UNIT-II** **Electrochemistry –I:** Electrical transport – Conduction in metals and in electrolyte solutions, specific conductance and equivalent conductance, measurement of equivalent conductance,	
					IIIrd	Variation of equivalent and specific conductance with dilution. Migration of ions and Kohlrausch	

						Law, Arrhennius theory of electrolyte dissociation and its limitations	
					IVth	Weak and strong electrolytes, Ostwald's dilution law, its uses and limitations. Debye-Huckel-Onsager's equation for strong electrolytes (elementary treatment only).	
					Vth	Transport number, definition and determination by Hittorf method and moving boundary method.	
				April	Ist	**UNIT-III Electrochemistry-II:** Types of reversible electrodes – gas metal – ion, metal –insoluble salt – anion and redox electrodes. Electrode reactions	
					IInd	Nernst equation, derivation of cell E.M.F. and single electrode potential, standard hydrogen electrode – reference electrodes – standard electrode potential, sign conventions, electrochemical series and its Significance.	
					IIIrd	**UNIT-IV (7 Hrs.)**	

						Electrolytic and Galvanic cells – reversible and irreversible cells, conventional representation of electrochemical cells. E.M.F. of a cell and its measurements. Computation of cell E.M.F.	
					IVth	Calculation of thermodynamic quantities of cell reactions ((ΔG, ΔH and K), Polarization, over potential and hydrogen overvoltage. Concentration cell with and without transport, liquid junction potential, application of concentration cells, valency of ions, solubility product and activity coefficient, potentiometric titrations.	
2.	Prof. Ruchika	B.Sc-II	Paper-XIV Organic chemistry-B	January	IInd	**UNIT-I Carboxylic Acid Derivatives:** Structure and nomenclature of acid chlorides, esters, amides and acid anhydrides.	**UNIT-II (7 Hrs.)** **Carboxylic Acid Derivatives:** Structure and nomenclature of acid chlorides, esters, amides and acid anhydrides. Relative stability & reactivityof acyl derivatives. Physical properties, interconversion of acid derivatives by nucleophilic acyl substitution.Preparation of carboxylic acid derivatives, chemical reactions. Mechanisms of esterification and hydrolysis(acidic and basic). **UNIT-III (8 Hrs.)** **Ethers , Epoxides Fats, Oils and Detergents:** Nomenclature of ether and methods of their formation, physical properties. Chemical reaction-cleavage and autoxidation, Ziesel's method. Synthesis of epoxides. Acid and base-catalyzed ring opening of epoxides, orientation of epoxide ring opening, reactions of Grignard and organolithium reagents with epoxides. Natural fats, edible and industrial
					IIIrd	Relative stability & reactivityof acyl derivatives. Physical properties, interconversion of acid	

						derivatives by nucleophilic acyl substitution	oils of vegetable origin, common fatty acids, glycerides, hydrogenation of unsaturated oils. Saponification value, iodine value, acid value. Soaps, synthetic detergents; alkyl and aryl sulphonates. **UNIT-IV (7 Hrs.)** **Organic Compounds of Nitrogen:** Preparation of nitroalkanes and nitroarenes. Chemical reactions of nitroalkanes. Mechanisms of nucleophilic substitution in nitroarenes and their reductions in acidic, neutral and alkaline media. Picric acid. Structure and nomenclature of amines, physical properties. Stereochemistry of amines, Separation of a mixture of primary, secondary and tertiary amines. Structural features effecting basicity of amines. Amine salts as phase transfer catalysis. Preparation of alkyl and aryl amines (reduction of nitro compounds, nitriles), reductive amination of aldehydic and ketonic compounds. Gabriel-phthalimide reaction, Hofmann bromamide reaction. **UNIT-IV** **Electromagnetic Spectrum: Absorption Spectra –I: (7 Hrs.)** Ultraviolet (UV) absorption spectroscopy – Absorption laws (Beer – Lambert Law), molar absorptivity, presentation and analysis of UV spectra, types of electronic transitions, effect of conjugation. Concept of chromophore and auxochrome. Bathochromic, hypsochromic, hyperchromic and hypochromic shifts. UV spectra of conjugated enes and enones. Woodward Fieser Rules and their applications in calculating maximum values of conjugated alkenes (cyclic as well as acyclic) and conjugated carbonyl compounds.
					IVth	Preparation of carboxylic acid derivatives, chemical reactions. Mechanisms of esterification and hydrolysis(acidic and basic).	
				February	Ist	**UNIT-II** **Ethers , Epoxides Fats, Oils and Detergents:** Nomenclature of ether and methods of their formation, physical properties. Chemical reaction-cleavage and autoxidation, Ziesel's method.	
					IInd	Synthesis of epoxides. Acid and base-catalyzed ring opening of epoxides, orientation of epoxide ring opening, reactions of Grignard and organolithium reagents with epoxides.	
					IIIrd	Natural fats, edible and industrial oils of vegetable origin, common fatty acids, glycerides, hydrogenation of unsaturated oils.	
					IVth	Saponification value, iodine value, acid value. Soaps, synthetic	

						detergents; alkyl and aryl sulphonates.	
				March	Ist	**UNIT-III** **Organic Compounds of Nitrogen:** Preparation of nitroalkanes and nitroarenes.	
					IInd	Chemical reactions of nitroalkanes. Mechanisms of nucleophilic substitution in nitroarenes and their reductions in acidic, neutral and alkaline media.	
					IIIrd	Picric acid. Structure and nomenclature of amines, physical properties. Stereochemistry of amines,	
					IVth	Separation of a mixture of primary, secondary and tertiary amines. Structural features effecting basicity of amines. Amine salts as phasetransfer catalysis.	
					Vth	Preparation of alkyl and aryl amines (reduction of nitro compounds, nitriles), reductive amination of aldehydic and ketonic compounds. Gabriel-phthalimide reaction, Hofmann bromamide reaction.	

				April	Ist	**UNIT-IV Electromagnetic Spectrum: Absorption Spectra –I:** Ultraviolet (UV) absorption spectroscopy – Absorption laws (Beer – Lambert Law), molar absorptivity, presentation and analysis of UV spectra, types of electronic transitions	
					IInd	Effect of conjugation. Concept of chromophore and auxochrome. Bathochromic, hypsochromic, hyperchromic and hypochromic shifts.	
					IIIrd	UV spectra of conjugated enes and enones.	
					IVth	Woodward Fieser Rules and their applications in calculating maximum values of conjugated alkenes (cyclic as well as acyclic) and conjugated carbonyl compounds.	
3.	Prof. Manpreet Kaur	B.Sc.-II	Paper-XIII Inorganic Chemistry-B	January	IInd	**UNIT-I Chemistry of Lanthanide Elements:** Electronic structure, oxidation states	**UNIT-I (8 Hrs.)** **Chemistry of Lanthanide Elements:** Electronic structure, oxidation states and ionic radii and lanthanide contraction, complex formation, occurrence and isolation, lanthanide compounds. **Chemistry of Actinides:** General features and chemistry of actinides, chemistry of separation of Np, Pu and Am
					IIIrd	Ionic radii and	

						lanthanide contraction	from U, similarities between the later actinides and the later lanthanides. **UNIT-II (7 Hrs.)** **Acids and Bases:** Arrhenius, Bronsted-Lowry, the Lux-Flood, solvent system and Lewis concepts of acids and bases. **UNIT-III (8 Hrs.)** **Oxidation and Reduction:** Use of redox potential data – analysis of redox cycle, redox stability in water – Frost, Latimer and Pourbaix diagrams. Principles involved in the extraction of the elements. **UNIT-IV (7 Hrs.)** **Non-aqueous Solvents:** Physical properties of a solvent, types of solvents and their general characteristics, reactions in non-aqueous solvents with reference to liquid NH_3 and liquid SO_2.
					IVth	Complex formation, occurrence and isolation,	
					Vth	Lanthanide compounds	
				February	IInd	**Chemistry of Actinides:** General features and chemistry of actinides	
					IIIrd	Chemistry of separation of Np, Pu and Am from U,	
					IVth	Similarities between the later actinides and the later lanthanides	
					Vth	**UNIT-II** **Acids and Bases:** Arrhenius, Bronsted-Lowry	
				March	IInd	The Lux-Flood, solvent system	
					IIIrd	Lewis concepts of acids and bases.	
					IVth	**UNIT-III** **Oxidation and Reduction:** Use of redox potential data – analysis of redox cycle	
					Vth	Redox stability in water – Frost, Latimer and Pourbaix diagrams	
				April	Ist	Principles involved in the extraction of the elements	
					IInd	**UNIT-IV** **Non-aqueous Solvents:**	

						Physical properties of a solvent, types of solvents	
					III[rd]	General characteristics of solvent, reactions in non-aqueous solvents with reference to liquid NH_3	
					IV[th]	Reactions in non-aqueous solvents with reference to liquid SO_2.	

BACHELOR OF SCIENCE Session 2017-2018(Sixth Semester January-May)							
S.No.	Teacher	Class	Paper	Month	Week		Syllabus
1.	Prof. Jyoti	B.Sc.-III	Paper-XXI Inorganic Chemistry-B	January	II[nd]	UNIT-I **Silicones and Phosphazenes**: Silicones	UNIT-I (7 Hrs.) **Silicones and Phosphazenes**: Silicones and phosphazenes as examples of inorganic polymers, nature of bonding in triphosphazenes. UNIT-II (8 Hrs.) **Hard and Soft Acids and Bases (HSAB)**: Classification of acids and bases as hard and soft Pearson's HSAB concept, acid-base strength and hardness and softness. Symbiosis, theoretical basis of hardness and softness, electronegativity and hardness and softness. UNIT-III (8 Hrs.) **Electronic Spectra of Transition Metal Complexes**: Types of electronic transitions, L – S coupling, selection rules for *d-d* transitions, spectroscopic ground states, Orgel – energy level diagram for $d1$ and d^0states, discussion of the electronic spectrum of $[Ti(H2O)_6]^{3+}$ complex ion.
					III[rd]	Phosphazenes	
					IV[th]	Nature of bonding in triphosphazenes.	
					V[th]	UNIT-II **Hard and Soft Acids and Bases (HSAB)**: Classification of acids and bases	

				February	II[nd]	Pearson's HSAB concept	UNIT-IV (7 Hrs.) **Magnetic Properties of Transition Metal Complexes**: Types of magnetic behaviour, methods of determining magnetic susceptibility, spin-only formula. Correlation of μ_s and μ_{eff} values, orbital contribution to magnetic moments, application of magnetic moment data for 3*d* metal complexes.
					III[rd]	Acid-base strength and hardness and softness.	
					IV[th]	Symbiosis, theoretical basis of hardness and softness, electronegativity and hardness and softness.	
					V[th]	UNIT-III **Electronic Spectra of Transition Metal Complexes**: Types of electronic transitions	
				March	II[nd]	L – S coupling, selection rules for *d-d* transitions	
					III[rd]	spectroscopic ground states, Orgel – energy level diagram for *d*1 state	
					IV[th]	Orgel – energy level diagram for d^0 state	
					V[th]	Discussion of the electronic spectrum of $[Ti(H2O)_6]^{3+}$ complex ion.	
				April	I[st]	UNIT-IV **Magnetic Properties of Transition Metal Complexes**: Types of magnetic behaviour,	
					II[nd]	Methods of	

						determining magnetic susceptibility, spin-only formula	
					III[rd]	Correlation of μ_s and μ_{eff} values, orbital contribution to magnetic moments,	
					IV[th]	Application of magnetic moment data for 3*d* metal complexes.	
2.	Prof. Vishal Sharma	B.Sc-III	Paper-XXII Organic chemistry-B	January	II[nd]	UNIT-I **Amino Acids, Peptides, Proteins and Nucleic Acids**: Classification, structure and stereochemistry of amino acids. Acid-base behavior, isoelectric point and electrophoresis.	UNIT-I (8 Hrs.) **Amino Acids, Peptides, Proteins and Nucleic Acids**: Classification, structure and stereochemistry of amino acids. Acid- base behavior, isoelectric point and electrophoresis. Preparation and reactions of L- amino acids. Structure and nomenclature of peptides and proteins. Classification of proteins. Peptide structure determination, end group analysis, selective hydrolysis of peptides. Classical peptide synthesis, solid – phase peptide synthesis. Structures of peptides and proteins. Levels of protein structure. Protein denaturation/renaturation. Nucleic Acids : Introduction. Constituents of nucleic acids. Ribonucleosides and ribonucleotides. The double helical Structure of DNA. UNIT-II (7 Hrs.) **Synthetic Polymers**: Addition or chain-growth polymerization. Free radical vinyl polymerization, ionic vinyl polymerization, Ziegler – Natta polymerization and vinyl polymers. Condensation or step growth polymerization. Polyesters, polyamides, phenol formaldehyde resins, urea formaldehyde resins, epoxy resins and polyurethanes. Natural and synthetic rubbers. UNIT-III (7 Hrs.) **Organic Synthesis via Enolates**: Acidity of ά-hydrogens, alkylation of diethyl malonate and ethyl acetoacetate. Synthesis of ethyl acetoacetate: the Claisen condensation. Keto-enol tautomerism of ethyl acetoacetate. Alkylation and acylation of enamines. UNIT-IV (8 Hrs.) **Organometallic Compounds**: Organomagnesium Compounds: The Grignard reagents – Formation, structure and chemical reactions. Organozinc Compounds: Formation and Chemical reactions. Organolithium Compounds: Formation and Chemical reactions.
					III[rd]	Preparation and reactions of L- amino acids	
					IV[th]	Structure and nomenclature of peptides and proteins. Classification of proteins.	
				February	I[st]	Peptide structure determination, end group analysis,	
					II[nd]	selective hydrolysis of peptides	
					III[rd]	Classical peptide	

						synthesis, solid – phase peptide synthesis. Structures of peptides and proteins	
					IVth	Levels of protein structure. Protein denaturation/renatura tion. Nucleic Acids : Introduction. Constituents of nucleic acids. Ribonucleosides and ribonucleotides. The double helical Structure of DNA.	
				March	Ist	UNIT-II **Synthetic Polymers**: Addition or chain-growth polymerization. Free radical vinyl polymerization, ionic vinyl polymerization,	
					IInd	Ziegler – Natta polymerization and vinyl polymers. Condensation or step growth polymerization. Polyesters, polyamides,	
					IIIrd	Phenol formaldehyde resins, urea formaldehyde resins, epoxy resins and polyurethanes.	
					IVth	Natural and synthetic	

						rubbers. UNIT-III **Organic Synthesis via Enolates**: Acidity of ά-hydrogens,	
					Vth	Alkylation of diethyl malonate and ethyl acetoacetate.	
				April	Ist	Synthesis of ethyl acetoacetate: the Claisen condensation. Keto-enol tautomerism of ethyl acetoacetate. Alkylation and acylation of enamines.	
					IInd	UNIT-IV **Organometallic Compounds**: Organomagnesium Compounds: The Grignard reagents – Formation, structure and chemical reactions.	
					IIIrd	Organozinc Compounds: Formation and Chemical reactions.	
					IVth	Organolithium Compounds: Formation and Chemical reactions.	
3.	Dr. Rishu Jain	B.Sc.-III	Paper-XXIII Physical	January	IInd	UNIT-I **Solid State-I**: Definition of space	UNIT-I (7 Hrs.) **Solid State-I**: Definition of space lattice, unit cell and Miller Indices Laws of Crystallography – (i) Law of

			Chemistry-B			lattice, unit cell and Miller Indices	Constancy of Interfacial Angles, (ii) Law of Rationality of Indices, (iii) Law of Symmetry. Symmetry elements in crystals. UNIT-II (8 Hrs.) **Solid State-II:** X-ray diffraction by crystals. Derivation of Bragg equation. Determination of crystal structure of NaCl, KCl and CsCl (Laue's method and powder method). Applications of Powder diffraction for structure determination, Thermal and photochemical reaction in solid state UNIT-III (8 Hrs.) **Spectroscopy** : Introduction : Electromagnetic radiation, regions of the spectrum, basic features of different spectrometers, statement of the Born-Oppenheimer approximation, degrees of freedom. **Rotational Spectrum**: Diatomic molecules. Energy levels of a rigid rotor (semi – classical principles), selection rules, spectral intensity, determination of bond length, qualitative description of non-rigid rotor, isotope effect. **UNIT-IV** (7 Hrs.) **Vibrational Spectrum**: Infrared Spectrum : Energy levels of simple harmonic oscillator, selection rules, pure vibrational spectrum intensity, determination of force constant and qualitative relation of force constant and bond energies, effect of anharmonic motion and isotope on the spectrum, idea of vibrational frequencies of different functional groups. Raman Spectrum : Concept of polarizability, pure rotational and pure vibrational, Raman spectra of diatomic molecules, selection rules. **Electronic Spectrum**: Concept of potential energy curves for bonding and antibonding molecular orbitals, qualitative description of selection rules and Franck- Condon principle. Qualitative description of σ, π and n M.O., their energy levels and the respective transitions.
					IIIrd	Laws of Crystallography – (i) Law of Constancy of Interfacial Angles, (ii) Law of Rationality of Indices, (iii) Law of Symmetry.	
					IVth	Symmetry elements in crystals.	
					Vth	UNIT-II (8 Hrs.) **Solid State-II:** X-ray diffraction by crystals. Derivation of Bragg equation.	
				February	IInd	Determination of crystal structure of NaCl, KCl and CsCl (Laue's method and powder method).	
					IIIrd	Applications of Powder diffraction for structure determination	
					IVth	Thermal and photochemical reaction in solid state	
					Vth	UNIT-III **Spectroscopy** : Introduction : Electromagnetic radiation, regions of the spectrum,	
				March	IInd	Basic features of different spectrometers,	

						statement of the Born-Oppenheimer approximation, degrees of freedom.	
					III[rd]	**Rotational Spectrum**: Diatomic molecules. Energy levels of a rigid rotor (semi – classical principles), selection rules, spectral intensity,	
					IV[th]	Determination of bond length, qualitative description of non-rigid rotor, isotope effect.	
					V[th]	**UNIT-IV Vibrational Spectrum**: Infrared Spectrum : Energy levels of simple harmonic oscillator, selection rules, pure vibrational spectrum intensity, determination of force constant and qualitative relation of force constant and bond energies,	
				April	I[st]	Effect of anharmonic motion and isotope on the spectrum, idea of vibrational frequencies of	

						different functional groups.	
					IInd	Raman Spectrum : Concept of polarizability, pure rotational and pure vibrational, Raman spectra of diatomic molecules, selection rule	
					IIIrd	**Electronic Spectrum**: Concept of potential energy curves for bonding and antibonding molecular orbitals, qualitative description of selection rules and Franck- Condon principle.	
					IVth	Qualitative description of s, p – and n M.O., their energy levels and the respective transitions.	

MASTER OF SCIENCE Session 2017-2018(Second Semester)							
S.No.	**Teacher**	**Class**	**Paper**	**Month**	**Week**		**Syllabus**
1.	Dr. Geeta Jallan	M.Sc.-I	CH-421-Inorganic chemistry	January	II[nd]	**UNIT 1** **Electronic Spectra and Magnetic Properties Of Transition Metal Complexes-** Spectroscopic ground states, correlation, Orgel and Tanabe-Sugano diagrams	**UNIT 1** **Electronic Spectra and Magnetic Properties Of Transition Metal Complexes-I (15 Hrs.)** Spectroscopic ground states, correlation, Orgel and Tanabe-Sugano diagrams for transition metal complexes (d1-d9 states), calculations of Dq, B and β parameters, charge transfer spectra and Heteropoly Acids And Salts **UNIT 2** **Electronic Spectra and Magnetic Properties Of Transition Metal Complexes-II (15 Hrs.)** Spectroscopic method of assignment of absolute configuration in optically active metal chelates and their stereo chemical information, anomalous magnetic moments, magnetic exchange coupling and spin crossover. **UNIT 3** **Metal II–Complexes (15 Hrs.)** Metal carbonyls, structure and bonding, vibrational spectra of metal carbonyls for bonding and structure elucidation, important reaction of metal carbonyls. Preparation, bonding structure and important reactions of transition metal nitrosyl, dinitrogen and dioxygen complexes, tertiary phosphine as ligand. **UNIT 4** **Metal Cluster (15 Hrs.)** Higher boranes, carboranes, metallobranes and metallocarboranes, metal carbonyl and halide clusters, compounds with metal-metal multiple bonds.
					III[rd]	For transition metal complexes (d1-d9 states), calculations of Dq, B and β parameters,	
					IV[th]	Charge transfer spectra and Heteropoly Acids And Salts **UNIT 2** **Electronic Spectra and Magnetic Properties Of Transition Metal Complexes-II** Spectroscopic method of assignment of absolute configuration in optically active metal chelates	
					V[th]	Their stereo chemical information, Anomalous magnetic moments,	
				February	I[st]	Magnetic exchange coupling and spin crossover. **UNIT 3** **Metal II–Complexes** Metal carbonyls, structure and bonding	
					II[nd]	Vibrational spectra of metal carbonyls for bonding and structure elucidation,	

					III[rd]	Important reaction of metal carbonyls. Preparation, bonding, structure of transition metal nitrosyl,	
					IV[th]	Preparation, bonding, structure of transition metal dinitrogen and dioxygen complexes, tertiary phosphine as ligand.	
				March	I[st]	Important reactions of transition metal nitrosyl, dinitrogen and dioxygen complexes	
					II[nd]	Important reactions of transition metal tertiary phosphine as ligand.	
					III[rd]	**UNIT 4** **Metal Cluster** Higher boranes, carboranes, metallobranes	
					IV[th]	Metallocarboranes, metal carbonyl and halide clusters,	
				April	I[st]	Compounds with metal-metal multiple bonds.	
2.	Dr. Arvinder Kaur	M.Sc-I	CH-422 Organic Chemistry-II	January	II[nd]	**UNIT 3** **Free Radical Reactions** Type of free radical reactions, free radical substitution mechanism at an aromatic substrate	**UNIT 3** **Free Radical Reactions (8 Hrs.)** Type of free radical reactions, free radical substitution mechanism at an aromatic substrate, neighbouring group assistance. Reactivity for aliphatic and aromatic substrates at a bridgehead. Reactivity in the attacking radicals. The effect of solvents on reactivity. Allylic halogenation (NBS), oxidation of aldehydes to carboxylic acids, auto-oxidation. Coupling of alkynes and arylation of aromatic compounds by diazonium salts. Sandmeyer reaction. Free Radical Rearrangement. Hunsdiecker reaction. **Elimination Reaction (7 Hrs.)** The E2, E1 and E1cB mechanisms and their spectrum, Orientation of the double bond. Reactivity effects of substrate structure, attacking base, the leaving group and the medium. Mechanism and orientation in pyrolytic elimination.
					III[rd]	Neighbouring group assistance. Reactivity for aliphatic and aromatic substrates at a bridgehead.	
					IV[th]	Reactivity in the attacking radicals. The effect of solvents on reactivity. Allylic halogenation (NBS)	

					Vth	Oxidation of aldehydes to carboxylic acids, auto-oxidation.	**UNIT 4** **Pericyclic Reactions (15Hrs.)** Molecular orbital symmetry, frontier orbitals of ethylene, 1,3-butadiene, 1, 3, 5-hexatriene and allyl system. Classification of pericyclic reactions. Woodward-Hoffmann correlation diagrams. FMO and PMO approach. Electrocyclic reactions conrotatory and disrotatory motions 4n, 4n +2 and allyl system. Cycloadditions-antarafacial suprafacial additions, 4n and 4n+2 systems, 2+2 additiion of ketenes, 1, 3-dipolar cycloadditions and cheleotropic reactions. Sigmatropic rearrangements-Suprafacial and antarafacial shifts of H. Sigmatropic shifts involving carbon moieties, [3, 3]-and [5, 5]- sigmatropic rearrangements. Claisen, Cope and aza-Cope rearrangement. Fluxional tautomerism. Ene reaction.
				February	Ist	Coupling of alkynes and arylation of aromatic compounds by diazonium salts. Sandmeyer reaction. Free Radical Rearrangement. Hunsdiecker reaction.	
					IInd	**Elimination Reaction** The E2, E1 and E1cB mechanisms and their spectrum,	
					IIIrd	Orientation of the double bond. Reactivity effects of substrate structure, attacking base,	
					IVth	The leaving group and the medium. Mechanism and orientation in pyrolytic elimination.	
				March	Ist	**Pericyclic Reactions** Molecular orbital symmetry, frontier orbitals of ethylene, 1,3-butadiene	
					IInd	1, 3, 5-hexatriene and allyl system. Classification of pericyclic reactions. Woodward-Hoffmann correlation diagrams.	
					IIIrd	FMO and PMO approach. Electrocyclic reactions conrotatory and disrotatory motions 4n, 4n +2 and allyl system.	
					IVth	Cycloadditions-antarafacial suprafacial additions, 4n and 4n+2 systems, 2+2 additiion of ketenes, 1, 3-dipolar cycloadditions	

				April	I[st]	Cheleotropic reactions. Sigmatropic rearrangements- Suprafacial and antarafacial shifts of H. Sigmatropic shifts involving carbon moieties	
					II[nd]	[3,3]-and [5,5]- sigmatropic rearrangements. Claisen, Cope and aza-Cope rearrangement. Fluxional tautomerism. Ene reaction.	
3.	Dr. Rishu Jain	M.Sc.-I	CH-42 Organic chemistry-II	January	II[nd]	**UNIT 1** **Reaction Mechanism, Structure and Reactivity** Types of mechanism, types of reactions, thermodynamics and kinetic requirement.	**UNIT 1** **Reaction Mechanism, Structure and Reactivity (8 Hrs.)** Types of mechanism, types of reactions, thermodynamics and kinetic requirement. Kinetic and thermodynamics control, Hammond's postulate, Curtin-Hammett Principle, Potential energy diagrams, transition states and intermediates, method of determining mechanisms, isotope effects. **Addition to Carbon-Carbon Multiple Bonds (7 Hrs.)** Mechanistic and stereochemical aspects of addition reaction involving electrophiles, nucleophiles and free radicals, regio and chemoselectivity, orientation and reactivity. Addition to cyclopropane ring. Hydrogenation of double and triple bonds, hydrogenation of aromatic ring. Hydroboration. Michael reaction. Sharpless asymmetric epoxidation. **UNIT 2** **Addition To Carbon-Heteroatom Multiple Bonds (15 Hrs.)** Mechanism of metal hydride reduction of saturated and unsaturated carbonyl compounds, esters and nitriles. Addition of grignard reagents, organozinc and organolithium reagents to carbonyl and unsaturated carbonyl compounds. Wittig reaction. Mechanism of condensation reactions involving enolates-Aldol, Knoevenagel, Claisen, Mannich, Benzoin, Perkin and Stobbe reactions. Hydrolysis of esters and amides, ammonolysis of esters.
					III[rd]	Kinetic and thermodynamics control, Hammond's postulate, Curtin-Hammett Principle,	
					IV[th]	Potential energy diagrams, transition states and intermediates, method of determining mechanisms, isotope effects.	
					V[th]	**Addition to Carbon-Carbon Multiple Bonds** Mechanistic and stereochemical aspects of addition reaction involving electrophiles, nucleophiles	
				February	I[st]	Free radicals, regio and chemoselectivity, orientation and reactivity.	
					II[nd]	Addition to cyclopropane ring. Hydrogenation of double and triple bonds,	
					III[rd]	Hydrogenation of aromatic ring. Hydroboration. Michael reaction. Sharpless asymmetric	

						epoxidation.	
					IVth	**UNIT 2** **Addition To Carbon-Heteroatom Multiple Bonds** Mechanism of metal hydride reduction of saturated and unsaturated carbonyl compounds	
				March	Ist	Esters and nitriles. Addition of grignard reagents, organozinc and organolithium reagents	
					IInd	To carbonyl and unsaturated carbonyl compounds. Wittig reaction. Mechanism of condensation reactions	
					IIIrd	Involving enolates-Aldol, Knoevenagel, Claisen, Mannich, Benzoin,	
					IVth	Perkin and Stobbe reactions.	
				April	Ist	Hydrolysis of esters and amides, ammonolysis of esters.	
4.	Prof. Sunny	M.Sc-I	CH-424 Group Theory, Spectroscopy and Diffraction Methods-IV	January	IInd	**UNIT 1** **Symmetry And Group Theory In Chemistry:** Symmetry elements & symmetry operation, definitions of group, subgroup,	**UNIT 1** **Symmetry And Group Theory In Chemistry: (15 Hrs.)** Symmetry elements & symmetry operation, definitions of group, subgroup, relation between orders of a finite group & its sub groups. Point group symmetry. Representations of groups by matrices (representation for the Cn, Cnv, Cnn, Dnn etc. group) character of a representation. The great orthogonality theorem and its importance character tables and there use-in spectroscopy. **UNIT 2** **Microwave Spectroscopy: (15 Hrs.)** Classification of molecules rigid rotor model, effect of isotopes; non rigid rotor Stark effect, nuclear and electron spin interaction & effect of external field. **Vibrational Spectroscopy:** Infrared Spectroscopy:- Linear Harmonic Oscillator, Vibrational energy of diatomic molecule zero point energy, force constants & bond lengths anharmonicity, morse potential energy diagram. Vibrational rotational
					IIIrd	Relation between orders of a finite group & its sub groups. Point group symmetry.	
					IVth	Representations of groups by matrices (representation for the Cn, Cnv, Cnn, Dnn etc. group) character of a representation.	
					Vth	The great orthogonality theorem and its importance character tables and there use-in spectroscopy.	
				February	Ist	**UNIT 2**	

						Microwave Spectroscopy: Classification of molecules rigid rotor model, effect of isotopes;	spectroscopy, P, Q, R, branches. Selection rules Normal modes of vibration, group frequencies, overtones, hot bands, Raman Vibrational:- Classical & quantum theories of Raman effect pure rotational, and vibrational. Rotational Raman spectroscopy. Coherent anti stokes Raman spectroscopy.
					II[nd]	Non rigid rotor Stark effect, nuclear and electron spin interaction	
					III[rd]	Effect of external field. **Vibrational Spectroscopy:** Infrared Spectroscopy:- Linear Harmonic Oscillator,	
					IV[th]	Vibrational energy of diatomic molecule zero point energy, force constants & bond lengths anharmonicity, morse potential energy diagram.	
				March	I[st]	Vibrational rotational spectroscopy, P, Q, R, branches. Selection rules Normal modes of vibration	
					II[nd]	Group frequencies, overtones, hot bands,	
					III[rd]	Raman Vibrational:- Classical & quantum theories of Raman effect pure rotational,	
					IV[th]	Vibrational. Rotational Raman spectroscopy. Coherent anti stokes Raman spectroscopy.	
5.	Prof. Vishal Sharma	M.Sc-I	CH-424 Group Theory, Spectroscopy and Diffraction Methods-IV	January	II[nd]	**UNIT 3** **Molecular Spectroscopy:** Energy levels, molecular orbital, Frank Condon's Principles,	**UNIT 3** **Molecular Spectroscopy: (15 Hrs.)** Energy levels, molecular orbital, Frank Condon's Principles, electronic spectra of polyatomic molecules emission spectra; radiative & non radiative decay. Spectra of transition metal complexes; change transfer spectra. **Basic Principles Photoelectric Effect, Ionization Process:** Koopman's theorem, photoelectron spectra of simple molecule. Auger electron spectroscopy. **Diffraction:**
					III[rd]	Electronic spectra of polyatomic molecules emission spectra; radiative & non radiative decay	
					IV[th]	Spectra of transition metal complexes; change transfer spectra.	

					Vth	**Basic Principles Photoelectric Effect, Ionization Process:** Koopman's theorem, photoelectron spectra of simple molecule.	Bragg's condition, Miller indices. Debye-Scherrer method for structure analysis. Principal and applications of neutron diffraction and electron diffraction **UNIT 4** **Magnetic Resonance Spectroscopy: (15 Hrs.)** Nuclear Magnetic Resonance Spectroscopy:- Nuclear spin, Nuclear resonance, shielding of magnetic nuclei, chemical shifts deshielding, spin spin interactions, (ABX, AMX, ABC, A2 B2) spin decoupling. Electron Spin resonance spectroscopy:-Basic values factors affecting 'g' value. Measurements, techniques, applications. Nuclear Quadrupole Resonance spectroscopy:- Quadrupole Nuclear moments, electic field gradient complex constants applications.
				February	Ist	Auger electron spectroscopy. **Diffraction:** Bragg's condition, Miller indices.	
					IInd	Debye-Scherrer method for structure analysis. Principal and applications of neutron diffraction and electron diffraction	
					IIIrd	**UNIT 4** **Magnetic Resonance Spectroscopy: (15 Hrs.)** Nuclear Magnetic Resonance Spectroscopy:- Nuclear spin, Nuclear resonance, shielding of magnetic nuclei,	
					IVth	Chemical shifts deshielding, spin spin interactions, (ABX, AMX, ABC, A2 B2) spin decoupling.	
				March	Ist	Electron Spin resonance spectroscopy:-Basic values factors affecting 'g' value.	
					IInd	Measurements, techniques, applications	
					IIIrd	Nuclear Quadrupole Resonance spectroscopy:- Quadrupole Nuclear moments,	
					IVth	Electic field gradient complex constants applications.	

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<td rowspan="8">6.</td>
<td rowspan="8">Dr. Geeta Jallan</td>
<td rowspan="8">M.Sc.-I</td>
<td rowspan="8">CH-423 Physical Chemistry-III</td>
<td rowspan="6">January</td>
<td>IInd</td>
<td>UNIT 1
Chemical Dynamics: Methods of determining rate laws, ionic reactions*, kinetic salt effects, steady state kinetics</td>
<td rowspan="8">UNIT 1
Chemical Dynamics: (15 Hrs.)
Methods of determining rate laws, ionic reactions*, kinetic salt effects, steady state kinetics, kinetic & thermodynamic control of reactions, treatments of unimolecular reactions, Dynamic
chain (pyrolysis of acetaldehyde composition of ethane), photochemical (H_2-Cl_2) reactions & oscillatory reactions (Belousov-Zhabotinsky reaction), homogeneous catalysis, kinetics of enzyme reactions, general features of fast reactions, study of fast reactions by flow method, relaxation method, flash photolysis, and NMR method, dynamics of molecular motion, probing the transition state, dynamics of barrierless chemical reactions in solution, dynamics of unimolecular reaction (Lindemann-Hinshelwood and Rice-Ramsperger-Kassel-Marcus Theories of unimolecular reactions)
UNIT 2
Non-equilibrium Thermodynamics: (15Hrs.)
Thermodynamic criteria for non eqbm states, entropy production and entropy flow, entropy balance eqns for different irreversible processes (eg. heat flow, chemical reaction etc.), transformation of generalized fluxes and forces, noneqbm stationary states, phenomenological equators, microscopic reversibility and onsager’s reciprocity relations, electro kinetic phenomenon, diffusion, electrical conduction, irreversible thermodynamics for biological system, coupled reactions.
Macromolecules:
Electrically conducting, fire resistant, liquid crystal polymers, Kinetics of polymerization, mechanism of polymerization, mol.mass determination (osmometry, viscometry, diffusion & light scattering methods), sedimentation, chain config. of macromolecules, calculation of average dimensions.</td>
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<td>IIIrd</td>
<td>Kinetic & thermodynamic control of reactions, treatments of unimolecular reactions, Dynamic
chain (pyrolysis of acetaldehyde composition of ethane),</td>
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<td>IVth</td>
<td>Photochemical (H_2-Cl_2) reactions & oscillatory reactions (Belousov-Zhabotinsky reaction), homogeneous catalysis, kinetics of enzyme reactions,</td>
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<td>Vth</td>
<td>General features of fast reactions, study of fast reactions by flow method, relaxation method, flash photolysis, and NMR method,</td>
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<td rowspan="4">February</td>
<td>Ist</td>
<td>Dynamics of molecular motion, probing the transition state, dynamics of barrierless chemical reactions in solution,</td>
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<td>IInd</td>
<td>Dynamics of unimolecular reaction (Lindemann-Hinshelwood and Rice-Ramsperger-Kassel-Marcus Theories of unimolecular reactions)</td>
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<tr>
<td>IIIrd</td>
<td>UNIT 2
Non-equilibrium Thermodynamics:
Thermodynamic criteria for non eqbm states, entropy production and entropy flow,</td>
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					IVth	Entropy balance eqns for different irreversible processes (eg. heat flow, chemical reaction etc.), transformation of generalized fluxes and forces,	
				March	Ist	Noneqbm stationary states, phenomenological equators, microscopic reversibility and onsager's reciprocity relations,	
					IInd	Electro kinetic phenomenon, diffusion, electrical conduction,	
					IIIrd	Irreversible thermodynamics for biological system, coupled reactions.	
					IVth	*Macromolecules:* Electrically conducting, fire resistant, liquid crystal polymers, Kinetics of polymerization,	
				April	Ist	Mechanism of polymerization, mol.mass determination (osmometry, viscometry, diffusion & light scattering methods),	
					IInd	Sedimentation, chain config. of macromolecules, calculation of average dimensions.	
7.	Prof. Vishal	M.Sc-I	CH-423 Physical Chemistry-III	January	IInd	**UNIT 3** **Surface Chemistry** **Adsorption:** Surface tension, capillary action, pressure difference across curved surface (Laplace eqn), vapour pressure of droplets	**UNIT 3** **Surface Chemistry (15 Hrs.)** **Adsorption:** Surface tension, capillary action, pressure difference across curved surface (Laplace eqn), vapour pressure of droplets, (Kelvin eqn), Gibb's adsorption isotherm, estimation of surface area (BET eqn), surface films on liquids (electro kinetic phenomenon), catalytic activity at surfaces. **Micelles:** Surface active agents, classification of surface active agents,

					III[rd]	(Kelvin eqn), Gibb's adsorption isotherm, estimation of surface area (BET eqn), surface films on liquids (electro kinetic phenomenon),	micellisation, hydrophobic interactions, critical micellar concentration, factors affecting CMC of surfactants, counter ions binding to micelles, thermodynamics of micellization-phase separation & mass action models, solubilization, microemulsion, reverse micelles. **UNIT 4** **Electrochemistry: (15 Hrs.)** Electrochemistry of solutions, Debye-Huckel treatment, and its extension, ion solvent interaction, Debye-Huckel-Jerrum model, Thermodynamics of electrified interface equations, derivation of electrocapillarity, Lippmann equations (surface excess), Methods of determining structures of electrified interfaces, Guoy-Chapman, Stern. Over potentials, exchange current density, derivation of Butler-volmer equation. Tafel plots. Quantum aspects of charge transfer at electrode solution interfaces, quantization of charge transfer, tunnelling Semiconductor interfaces- theory of double layer interfaces, effects of light at semiconductor solution interface. **Electrocatalysis** : Influence of various parameters, H-electrode, polarography, theory Ilkovic eqn, (excluding derivation), Half wave potential & its significance, electrocardiography, introduction to corrosion, homogeneous, theory, forms of corrosion, corrosion monitoring.
					IV[th]	Catalytic activity at surfaces. **Micelles:** Surface active agents, classification of surface active agents, micellisation, hydrophobic interactions,	
					V[th]	Critical micellar concentration, factors affecting CMC of surfactants, counter ions binding to micelles, thermodynamics of micellization-phase separation	
				February	I[st]	Mass action models, solubilization, microemulsion, reverse micelles.	
					II[nd]	**UNIT 4** **Electrochemistry:** Electrochemistry of solutions, Debye-Huckel treatment, and its extension, ion solvent interaction, Debye-Huckel-Jerrum model,	
					III[rd]	Thermodynamics of electrified interface equations, derivation of electrocapillarity, Lippmann equations (surface excess), Methods of determining structures of electrified interfaces,	
					IV[th]	Guoy-Chapman, Stern. Over potentials, exchange current density, derivation of Butler-volmer equation. Tafel plots.	

				March	Ist	Quantum aspects of charge transfer at electrode solution interfaces, quantization of charge transfer, tunnelling	
					IInd	Semiconductor interfaces-theory of double layer interfaces, effects of light at semiconductor solution interface.	
					IIIrd	**Electrocatalysis** : Influence of various parameters, H-electrode, polarography, theory Ilkovic eqn, (excluding derivation),	
					IVth	Half wave potential & its significance, electrocardiography,	
				April	Ist	Introduction to corrosion, homogeneous, theory, forms of corrosion,	
					IInd	Corrosion monitoring.	

End Semester Examinations	**11-05-18To Friday**	**01-06-18 Friday**	**(19 days including Saturday)**
Semester Vacation (Tentative)	**02-06-18To Saturday**	**08-07-18 Sunday**	**(37days)**

Total teaching days of Academic Term II = 99 + 96 = 195 days