GUJRANWALA GURU NANAK KHALSA COLLEGE, CIVIL LINES, LUDHIANA

AFFILIATED TO PANJAB UNIVERSITY, CHANDIGARH

Academic Calendar for the session 2016-17 with Under Graduate & Post Graduate Chemistry Course having Semester System of examination:-

SummerVacation 25-05-16To 06-07-16 (43 days)

Wednesday Wednesday

Academic Calendar

Colleges Open on and normal **07-07-16**

Admission for on-going Classes **Thursday**

Admission Schedule

16 (9 days)

(13 days)

Monday **Monday**

Commencement of Teaching

20-08-16(16 days)

Saturday

Academic Term –I (a)	**11-07-16To**	**10-10-16**	**(75 teaching**	
1st& 3rd& 5th semester	**Monday**		**Monday**	**days)**
Autumn Break	**11-10-16To**	**17-10-16**	**(07 days)**	
	Tuesday		**Monday**	
Academic Term –I (b)	**18-10-16To**	**02-12-16**	**(38 teaching**	
	Tuesday		**Friday**	**days)**

Total teaching days of Academic Term I = 75 + 38 = 113 Days

BACHELOR OF SCIENCE Session 2016-2017(First Semester)							
S.No.	Teacher	Class	Paper	Month	Week		Syllabus
1.	Dr.GeetaJallan	B.Sc.-I	Paper-III Physical Chemistry-A	July	IIIrd	**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 behaviour, Van der Waal's equation of state. **Critical Phenomena :** PV isotherms of real gases, continuity of states, the isotherms of Van 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.
					IVth	Differentiation and integration of functions like ex, xn, sin x, log x	
				August	Ist	Maxima and minima, partial differentiation and reciprocity relations	
					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.	Catalysis and general characteristics of catalytic reactions, Homogeneous catalysis, acid-base catalysis and enzyme catalysis including their mechanisms, MichaelisMenten equation for enzyme catalysis and its mechanism.
					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	IInd	The law of corresponding states, reduced equation of state. **Molecular Velocities:** Root mean square, average and most probable velocities.	
					IIIrd	Qualitative discussion of the Maxwell's distribution of molecular velocities,	

						collision number,	
					IVth	Mean free path and collision diameter. Liquification of gases (based on Joule-Thomson effect).	
					Vth	**Chemical Kinetics-I :** Chemical kinetics and its scope, rate of a reaction, factors influencing the rate of a reaction-concentration,	
				October	Ist	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.	
					IInd	Determination of the order of reaction – differential method,	
					AUTUMN BREAK		
					IIIrd	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,	
					IVth	Arrhenius equation, concept of activation energy. Simple collision theory based on hard sphere model, transition state theory (equilibrium hypothesis).	
				November	Ist	Expression for the rate constant based on equilibrium constant and thermodynamic aspects. Catalysis and general characteristics of catalytic reactions, Homogeneous catalysis,	
					IInd	Acid-base catalysis and enzyme catalysis including their mechanisms, MichaelisMenten equation for enzyme catalysis and its mechanism	
2.	Dr.ArvinderKaur	B.Sc-I	Paper-II Organic chemistry-	July	IIIrd	**UNIT-I Structure and Bonding**	**UNIT-I (8 Hrs.)** **Structure and Bonding :** Hybridization, bond lengths and bond angles, bond energy, localized and delocalized

			A			**:**Hybridization, bond lengths and bond angles, bond energy, localized and delocalized chemical bond, Vander Waals interactions,	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.)** **Electromagnetic Spectrum : Absorption Spectra :** 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. **UNIT-III (8 Hrs.)** **Stereochemistry of Organic Compounds I:** Concept of isomerism, Types of isomerism. Optical isomerism – Elements of symmetry, molecular chirality, enantiomers, stereogeniccenter, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogeniccenters, diastereomers, threo and erythrodiastereomers, 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.
					IVth	Resonance, hyperconjugation, aromaticity, inductive and field effects, hydrogen bonding.	
				August	Ist	**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.	
					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 Electromagnetic Spectrum: Absorption Spectra :** Ultraviolet (UV) absorption spectroscopy – Absorption laws (Beer – Lambert Law), molar absorptivity, presentation and analysis of UV spectra	
				September	Ist	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.	
					IInd	Woodward	

						FiesherRules and their applications in calculating maximum values of conjugated alkenes (cyclic as well as acyclic) and conjugated carbonyl compounds.	
					IIIrd	**UNIT-III Stereochemistry of Organic Compounds I:** Concept of isomerism, Types of isomerism. Optical isomerism – Elements of symmetry, molecular chirality, enantiomers, stereogeniccenter,	
					IVth	Optical activity, properties of enantiomers, chiral and achiral molecules with two stereogeniccenters, diastereomers, threo and erythrodiastereomers, 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	IInd	**UNIT-IV Stereochemistry of Organic Compounds II :** Geometric isomerism: Determination of configuration of geometric isomers. E & Z system of nomenclature	
					AUTUMN BREAK		
					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.Ruchi	B.Sc.-I	Paper-I	July	IIIrd	**UNIT-I**	**UNIT-I (8 Hrs.)**

	ka		Inorganic Chemistry-A			**Atomic Structure :** Idea of de Broglie matter waves, Heisenberg uncertainty principle, atomic orbitals, Schrodinger wave equation, significance of Ψ and Ψ^2	**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 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.
					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.	
					IInd	**UNIT-II Periodic Properties :**Position of elements in the periodic table; effective nuclear charge and its calculations. Atomic and ionic radii,	
					IIIrd	Ionization energy, electron affinity and electronegativity—definition, methods of determination or evaluation,	

					IVth	Trends in periodic table and applications in predicting and explaining the chemical behaviour.	
					Vth	**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	IInd	Comparative study, diagonal relationships, salient features of hydrides,	
					IIIrd	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	I^{st}	Valence shell electron pair repulsion (VSEPR) theory to NH_3, H_3O+, SF_4, ClF_3, ICl^-_2 and H_2O	
					II^{nd}	MO theory	
					AUTUMN BREAK		
					III^{rd}	Homonuclear (elements and ions of 1st and 2nd row),	
					IVth	Heteronuclear (BO, CN, CO^+, NO^+, CO, CN^-)	
				November	Ist	Diatomic molecules. Percentage ionic character from dipole moment and electronegativity difference.	

BACHELOR OF SCIENCESession 2016-2017(Third Semester)

S.No.	Teacher	Class	Paper	Month	Week		Syllabus
1.	Dr.Rishu Jain	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	I[st]	Entropy change in ideal gases and mixing of gases.	
					II[nd]	**UNIT-IV Thermodynamics-III:** *Third Law of Thermodynamics:* Nernst heat theorem, statement and concept of residual entropy,	
					AUTUMN BREAK		

					III[rd]	Evaluation of absolute entropy from heat capacity data. Gibbs and Helmholtz functions	
					IVth	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.	
					IInd	Variation of G and A with P, V and T.	
2.	Dr.ArvinderKaur	B.Sc-II	Paper-X Organic chemistry-A	July	III[rd]	**Alkyl and Aryl Halides** Nomenclature and classes of alkyl halides, methods of formation, chemical reactions.	**UNIT-I (7Hrs.)** **Alkyl and Aryl Halides** Nomenclature and classes of alkyl halides, methods of formation, chemical reactions. Mechanisms of nucleophilic substitution reactions of alkyl halides, SN_2 and SN_1 reactions with energy profile diagrams. Polyhalogencompounds : 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. **UNIT-II (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-III (8 Hrs.)**
					IV[th]	Mechanisms of nucleophilic substitution reactions of alkyl halides, SN_1 reactions with energy profile diagrams.	
				August	I[st]	Mechanisms of nucleophilic substitution reactions of alkyl halides, SN_2 with energy profile diagrams.	
					II[nd]	Polyhalogen	

						compounds: chloroform, carbon tetrachloride. Methods of formation of aryl halides, nuclear and side chain reactions	**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-IV (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, LiAIH4 and NaBH4 reductions.
					III[rd]	The addition-elimination and the elimination-addition mechanisms of nucleophilic aromatic substitution reactions	
					IV[th]	Relative relativities of alkyl halides vs. allyl, vinyl and aryl halides. **UNIT-II** **Alcohols and Phenols:** Classification and nomenclature	
				September	I[st]	Monohydric alcohols-Nomenclature, methods of formation by reduction of aldehydes, ketones, carboxylic acids and esters	
					II[nd]	Hydrogen bonding. Acidic nature. Reactions of alcohols. Dihydric and Trihydric alcohols-Nomenclature, methods of	

						formation, chemical reactions of vicinal glycols and glycerol.	
					III[rd]	Preparation of phenols, physical properties and acidic character. Comparative acidic strengths of alcohols and phenols, resonance stabilization of phenoxide ion	
					IV[th]	Reactions of phenols-electrophilic aromatic substitution, acylation and carboxylation. Mechanisms of Fries rearrangement	
					V[th]	Claisen rearrangement, Gatterman synthesis, and Reimer-Tiemann reaction.	
				October	II[nd]	**UNIT-III 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,	

					AUTUMN BREAK		
					III[rd]	Synthesis of aldehydes and ketones using 1,3-dithianes, synthesis of ketones from nitriles and from carboxylic acids, Physical properties.	
					IVth	**UNIT-IV Aldehydes and Ketones-II** Mechanism of nucleophilic additions to carbonyl group with particular emphasis on benzoin, aldol, Perkin and Knoevenagel condensations.	
				November	Ist	Condensation with ammonia and its derivatives. Wittig reaction, Mannich reaction. Use of acetals as protecting group	
					IInd	Oxidation of aldehydes, Baeyer-Villiger oxidation of ketones, Cannizzaro reaction, MPV, Clemmensen, Wolff-Kishner, LiAIH4 and NaBH4 reductions.	
3.	Prof.Ruchika	B.Sc.-II	Paper-IX Inorganic	July	III[rd]	**UNIT-I Chemistry of**	**UNIT-I (8 Hrs.) Chemistry of Elements of First Transition Series:**

			Chemistry-A			**Elements of First Transition Series:** Characteristic properties of *d*-block elements.	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. magnetic 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	
					IIIrd	Effective atomic number concept, chelates,	
					IVth	Isomerism in coordination compounds	
					Vth	Isomerism in coordination compounds	
				October	Ist	**UNIT-IV**	

						Chemistry of Coordination Compounds-II Valence bond theory of transition metal complexes	
					II[nd]	Properties of Coordination compounds i.e. magenetic properties, colours (Qualitative approach only),	
					AUTUMN BREAK		
					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),	

BACHELOR OF SCIENCESession 2016-2017(Fifth Semester)						
S.No.	Teacher	Class	Paper	Month	Week	Syllabus

1.	Dr.GeetaJallan	B.Sc.-III	Paper-XVII Inorganic Chemistry-A	July	IIIrd	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.
					IVth	Crystal field splitting in octahedral complexes	
				August	Ist	Crystal field splitting in tetrahedral complexes	
					IInd	Crystal field splitting in square planar complexes, factors affecting the crystal – field parameters, Spectro chemical Series.	
					IIIrd	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	II[nd]	UNIT-III **Organometallic Chemistry**: Definition, nomenclature and classification of organometallic compounds.	
					III[rd]	Preparation, properties, bonding and applications of alkyls and aryls of Li, Al	
					IV[th]	Preparation, properties, bonding and applications of alkyls and aryls of Hg, Sn and Ti,	
					V[th]	A brief account of metal – ethylenic complexes and homogeneous hydrogenation,	
				October	I[st]	Mononuclear carbonyls and the nature of bonding in metal carbonyls	
					II[nd]	UNIT-IV **Bioinorganic Chemistry**: Essential and trace elements in biological processes	
					AUTUMN BREAK		
					III[rd]	Metalloporphyrins with special reference to haemoglobin and	

						myoglobin.	
					IVth	Biological role of alkali and alkaline earth metal ions.	
				November	Ist	Nitrogen fixation.	
2.	Prof.Ruchika	B.Sc-III	Paper-XVIII Organic chemistry-A	July	IIIrd	UNIT-I **Spectroscopy**: Nuclear magnetic resonance (NMR) spectroscopy. Proton magnetic resonance (1H NMR) spectroscopy,	UNIT-I (8 Hrs.) **Spectroscopy**: Nuclear magnetic resonance (NMR) spectroscopy. Proton magnetic resonance (1H 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-II (7 Hrs.) **Electromagnetic Spectrum: Absorption Spectra**: 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.) **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 threodiastereomers. 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. UNIT-IV (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
					IVth	Nuclear shielding and deshielding, chemical shift and molecular structure,	
				August	Ist	Spin-spin splitting and coupling constants, area of signals	
					IInd	Interpretation of PMR spectra	
					IIIrd	Interpretation of ethyl bromide, ethanol, acetaldehyde, 1,1,2-tribromoethane, ethyl acetate, toluene and acetophenone.	
					IVth	Applications of NMR	
				September	Ist	**Electromagnetic Spectrum: Absorption Spectra**: Infrared (IR) absorption spectroscopy –	

						Molecular vibrations, Hooke's law, selection rules	indole, quinoline and isoquinoline.
					II[nd]	Intensity and position of IR bands, measurement of IR spectrum, fingerprint region,	
					III[rd]	Characteristic absorptions of various functional groups and interpretation of IR spectra of simple organic compounds	
					IV[th]	Problems pertaining to the structure elucidation of simple organic compounds using UV, IR and PMR spectroscopic techniques.	
					V[th]	UNIT-III **Carbohydrates**: Classification and nomenclature. Monosaccharides	
				October	II[nd]	Mechanism of osazone formation, interconversion of glucose and fructose, chain lengthening and chain shortening of aldoses. Configuration of monosaccharides. Erythro and threodiastereomers	

					AUTUMN BREAK		
					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-IV **Heterocyclic Compounds**: Introduction : Molecular orbital picture	
				November	I[st]	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.	
					II[nd]	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.Rishu Jain	B.Sc.-III	Paper-XIX Physical Chemistry-A	July	III[rd]	**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

					IVth	Heat capacity of solids, Bohr's model of hydrogen atom (no derivation) and its defects, Compton effect. De Broglie hypothesis,	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.
				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.	
					IIIrd	Schrodinger wave equation for H-atom, separation into three equations (without derivation), quantum numbers and their importance,	
					IVth	Hydrogen like wave functions, radial wave functions, angular wave functions.	
					Vth	**UNIT-II Elementary Quantum**	

						Mechanics-II: Molecular orbital theory, basic ideas – criteria for forming M.O. from A.O.,	
				September	IInd	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,	
					IIIrd	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	Ist	Jablonski diagram depicting various processes occurring in the excited state.	
					IInd	**UNIT-IV Photochemistry-II**: Qualitative description of fluorescence, phosphorescence, non-radiative processes (internal conversion, intersystem crossing)	
					AUTUMN BREAK		
					IIIrd	Quantum yield, photosensitized reactions – energy transfer processes (simple examples).	
					IVth	Photochemistry of carbonyl compounds and alkenes.	

End Semester Examinations **03-12-16To Saturday** **28-12-16 Wednesday** **(22 days including Saturday)**

Semester Vacation	**29-12-16 To**	**10-01-17**	**(13 days)**
(Winter Break)	**Thursday**		**Tuesday**

Academic Term –II

2nd& 4th&6th semester

Even Semesters

College reopens after	**11-01-17To**	**05-05-17**	**(94 teaching**	
Semester Examination	**Wednesday**		**Friday**	**days)**

Total teaching days of Academic Term II = 94 days

BACHELOR OF SCIENCESession 2016-2017(Second Semester January-May)						
S.No.	Teacher	Class	Paper	Month	Week	Syllabus

1.	Dr.GeetaJallan	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.	
					IVth	Experimental methods for determining various colligative properties. Abnormal molar mass, degree of dissociation and association of solutes.	
2.	Dr.ArvinderKaur	B.Sc-I	Paper-VI Organic	January	II[nd]	**UNIT-I Alkanes and**	**UNIT-I (7 Hrs.) Alkanes and Cycloalkanes :**

			chemistry-B			**Cycloalkanes :** Isomerism in alkanes, sources, methods of formation (with special reference to Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation of carboxylic acids),	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 limitations. Ring strain in small rings (cyclopropane and cyclobutane), theory of stainless rings. The case of cyclopropanering : banana bonds. **UNIT-II (8 Hrs.)** **Alkenes, Cycloalkenes**: 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-III (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-IV (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.
					IIIrd	Physical properties and chemical reactions of alkanes. Mechanism of free radical halogenation of alkanes : Orientation, reactivity and selectivity.	
					IVth	Cycloalkanes—nomenclature, methods of formation, chemical reactions, Baeyer's strain theory and its limitations.	
				February	Ist	Ring strain in small rings (cyclopropane and cyclobutane), theory of stainless rings. The case ofcyclopropane ring : banana bonds.	
					IInd	**UNIT-II Alkenes, Cycloalkenes**: Nomenclature of	

						alkenes, methods of formation, mechanisms of dehydration of alcohols and dehydrohalogenation of alkyl halides, regioselectivity in alcohol dehydration	
					III[rd]	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	
					IV[th]	Markownikoff's rule, hydroboration – oxidation, oxymercuration-reduction. Epoxidation, ozonolysis, hydration, hydroxylation and oxidation with KMnO4.	
				March	I[st]	Polymerization of alkenes. Substitution at the allylic and vinylic positions of alkenes. Industrial applications of ethylene and propene.	

					II[nd]	**UNIT-III** **Dienes and Alkynes :**Methods of formation, conformation and chemical reactions of cycloalkenes. Nomenclature and classification of dienes : Isolated, conjugated and cumulated dienes.	
					III[rd]	Structure of allenes and butadiene, methods of formation, polymerization. Chemical reactions – 1,2 and 1,4 additions, Diels-Alder reaction.	
					IV[th]	Nomenclature, structure and bonding in alkynes. Methods of formation. Chemical reactions of alkynes, acidity of alkynes	
					V[th]	Mechanism of electrophilic and nucleophilic addition reactions, hydroboration-oxidation, metal-ammonia reductions, oxidation and polymerization.	
				April	I[st]	**UNIT-IV**	

						Arenes and Aromaticity: Nomenclature of benzene derivatives. The aryl group, Aromatic nucleus and side chain, Structure of benzene : Molecular formula and Kekule structure.	
					IInd	Stability and carbon-carbon bond lengths of benzene, resonance structure, MO picture. Aromaticity : The Huckel rule, aromatic ions.	
					IIIrd	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	
					IVth	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.	
3.	Prof.Ruchika	B.Sc.-I	Paper- V Inorganic Chemistry-B	January	II[nd]	**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), tetrasulphurtetranitride, basic properties of halogens, interhalogens and polyhalides.
					III[rd]	Ionic structures, (NaCl type, Zinc blende, Wurtzite, CaF_2 and antifluorite)	
					IV[th]	Radius ratio rule and coordination number, limitation of radius ratio rule, lattice defects, semiconductors.	
					V[th]	**UNIT-II Chemical Bonding-III** Lattice energy and Born-Haber cycle	
				February	II[nd]	Solvation energy and solubility of ionic solids, polarizing power and polarisability of ions,	
					III[rd]	Fajan's rule. Metallic bond-free electron, valence bond and band theories.	
					IV[th]	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]	Tetrasulphurtetranitride basic properties of halogens, interhalogens and polyhalides.	

BACHELOR OF SCIENCESession 2016-2017(Fourth Semester January-May)							
S.No.	Teacher	Class	Paper	Month	Week		Syllabus
1.	Dr.Rishu Jain	B.Sc.-II	Paper-XV Physical Chemistry-B	January	II[nd]	**UNIT-I** **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. **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
					III[rd]	Phase equilibria of one component system—water, CO_2 and S systems.	
					IV[th]	Phase equilibria of two component system –solid –liquid equilibria, simple	

						eutectic – Bi-Cd system, desiliverisation of lead.	theory of electrolyte dissociation and its limitations, weak 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.
					V^{th}	Solid solutions—compound formation with congruent melting point (Mg-Zn) and incongruent melting point, (NaCl-H_2O) system.	
				February	II^{nd}	Freezing mixtures, acetone-dry ice.	
					III^{rd}	Partially Miscible Liquids –Phenol-water, trimethylamine – water, nicotine – water systems.	
					IV^{th}	Lower and upper consolute temperature. Effect of impurity on consolute temperature, immiscible liquids, steam distillation.	
					V^{th}	Nernst distribution law-thermodynamic derivation, applications	
				March	II^{nd}	**UNIT-II** **Electrochemistry – I:** Electrical transport – Conduction in metals	

						and in electrolyte solutions, specific conductance and equivalent conductance, measurement of equivalent conductance,	
					III[rd]	Variation of equivalent and specific conductance with dilution. Migration of ions and Kohlrausch Law, Arrhennius theory of electrolyte dissociation and its limitations	
					IV[th]	Weak and strong electrolytes, Ostwald's dilution law, its uses and limitations. Debye-Huckel-Onsager's equation for strong electrolytes (elementary treatment only).	
					V[th]	Transport number, definition and determination by Hittorf method and moving boundary method.	
				April	I[st]	**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** 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.	Dr.Arvinder Kaur	B.Sc-II	Paper-XIV Organic chemistry-B	January	II[nd]	**UNIT-I** **Carboxylic Acids:** Nomenclature, structure and bonding, physical properties, acidity of carboxylic acids, effects of substitutions on acid strength.	**UNIT-I (8 Hrs.)** **Carboxylic Acids:** 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 acid (structural features only). Method of formation and chemical reactions of unsaturated monocarboxylic acids. Dicarboxylic Acids: Methods of formation and effect of heat and hydrating agents. **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 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:**
					III[rd]	Preparations of carboxylic acids. Reactions of carboxylic acids. Hell-Volhard-Zelinsky reaction.	
					IV[th]	Synthesis of acid chlorides, esters and amides, Reduction of carboxylic acids. Mechanism of decarboxylation. Methods of formation and chemical reactions of halo acids	

				February	I[st]	Hydroxyl acids: Malic, tartaric and citric acid (structural features only). Method of formation and chemical reactions of unsaturated monocarboxylic acids.	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.
					II[nd]	Dicarboxylic Acids: Methods of formation and effect of heat and hydrating agents. **UNIT-II Carboxylic Acid Derivatives:** Structure and nomenclature of acid chlorides, esters, amides and acid anhydrides.	
					III[rd]	Relative stability & reactivityof acyl derivatives. Physical properties, interconversion of acid derivatives by nucleophilic acyl substitution	
					IV[th]	Preparation of carboxylic acid derivatives, chemical reactions. Mechanisms of esterification and hydrolysis(acidic and basic).	

				March	Ist	**UNIT-III** **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.	
					Vth	**UNIT-IV** **Organic**	

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

						bromamide reaction.	
3.	Prof.Ruchika	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 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.
					IIIrd	Ionic radii and lanthanide contraction	
					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	
					V^{th}	Redox stability in water – Frost, Latimer and Pourbaix diagrams	
				April	I^{st}	Principles involved in the extraction of the elements	
					II^{nd}	**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 SCIENCESession 2016-2017(Sixth Semester January-May)							
S.No.	Teacher	Class	Paper	Month	Week		Syllabus
1.	Dr.GeetaJallan	B.Sc.-III	Paper-XXI Inorganic Chemistry-B	January	IInd	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 *d*1 and d^0states, discussion of the electronic spectrum of $[Ti(H2O)_6]^{3+}$ complex ion. 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.
					IIIrd	Phosphazenes	
					IVth	Nature of bonding in triphosphazenes.	
					Vth	UNIT-II **Hard and Soft Acids and Bases (HSAB)**: Classification of acids and bases	
				February	IInd	Pearson's HSAB concept	
					IIIrd	Acid-base strength and hardness and softness.	
					IVth	Symbiosis, theoretical basis of hardness and softness, electronegativity and hardness and softness.	
					Vth	UNIT-III **Electronic Spectra of Transition Metal Complexes**: Types of electronic transitions	
				March	IInd	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,	
					IVth	Application of magnetic moment data for 3*d* metal complexes.	
2.	Prof.Ruchika	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-	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.

						base behavior, isoelectric point and electrophoresis.	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-enoltautomerism 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	
					IV[th]	Levels of protein structure. Protein denaturation/renaturation. Nucleic Acids : Introduction. Constituents of nucleic acids. Ribonucleosides and ribonucleotides. The double helical Structure of DNA.	
				March	I[st]	UNIT-II **Synthetic Polymers**: Addition or chain-growth	

						polymerization. Free radical vinyl polymerization, ionic vinyl polymerization,	
					II[nd]	Ziegler – Natta polymerization and vinyl polymers. Condensation or step growth polymerization. Polyesters, polyamides,	
					III[rd]	Phenol formaldehyde resins, urea formaldehyde resins, epoxy resins and polyurethanes.	
					IV[th]	Natural and synthetic rubbers. UNIT-III **Organic Synthesis via Enolates**: Acidity of ά-hydrogens,	
					V[th]	alkylation of diethyl malonate and ethyl acetoacetate.	
				April	I[st]	Synthesis of ethyl acetoacetate: the Claisen condensation. Keto-enoltautomerism of ethyl acetoacetate. Alkylation and acylation of enamines.	

					II[nd]	UNIT-IV **Organometallic Compounds**: Organomagnesium Compounds: The Grignard reagents – Formation, structure and chemical reactions.	
					III[rd]	Organozinc Compounds: Formation and Chemical reactions.	
					IV[th]	Organolithium Compounds: Formation and Chemical reactions.	
3.	Dr.Rishu Jain	B.Sc.-III	Paper-XXIII Physical Chemistry-B	January	II[nd]	UNIT-I **Solid State-I**: Definition of space lattice, unit cell and Miller Indices	UNIT-I (7 Hrs.) **Solid State-I**: Definition of space lattice, unit cell and Miller Indices Laws of Crystallography – (i) Law of 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**:
					III[rd]	Laws of Crystallography – (i) Law of Constancy of Interfacial Angles, (ii) Law of Rationality of Indices, (iii) Law of Symmetry.	
					IV[th]	Symmetry elements in crystals.	
					V[th]	UNIT-II **Solid State-II:** X-ray diffraction by crystals. Derivation of Bragg equation.	
				February	II[nd]	Determination of	

						crystal structure of NaCl, KCl and CsCl (Laue's method and powder method).	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.
					III[rd]	Applications of Powder diffraction for structure determination	
					IV[th]	Thermal and photochemical reaction in solid state	
					V[th]	UNIT-III **Spectroscopy** : Introduction : Electromagnetic radiation, regions of the spectrum,	
				March	II[nd]	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.	

					Vth	**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	Ist	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 σ, π and n M.O., their energy levels and the respective transitions.	

End Semester **06-05-17To31-05-17** **(22 days including**

Examinations **Saturday** **Wednesday** **Saturday)**

Semester Vacation **01-06-17To08-07-17** **(39 days)**

(Tentative) **Thursday** **Saturday**

Total teaching days of Academic Term II =113 + 94 = 207 days