Maharaja Ranjit Singh College of Professional Sciences, Indore

Department of Biosciences

Lesson Plan - B. Sc. I Year (July 2018 - March 2019)

Subject - Chemistry - I Paper : Physical Chemistry

Teacher - Prof. Deepanshu Pandey

Day/Lecture	Unit	Topic
1	Unit 1	**A. Mathematical Concept :**
2	Unit 1	Logarithm relations (rules & types)
3	Unit 1	Use of log table and antilog table in calculation
4	Unit 1	Curve sketching (Straigth line and linear graphs), Calculation of slopes
5	Unit 1	Differentiation of functions like Kx,sin x, log x
6	Unit 1	Multiplication and division in differentiation
7	Unit 1	maxima and minima
8	Unit 1	partial differentiation, Integration of some useful/ relevent functions
9	Unit 1	Factorials
10	Unit 1	Probability
11	Unit 1	Revision of chapter after completion of unit
12	Unit 1	**B. Gaseous States and Molecular Velocitites :**
13	Unit 1	Critical Phenomenon: PV isotherm of ideal gases
14	Unit 1	Andrew's experiment
15	Unit 1	Continuity of state
16	Unit 1	Isotherms of van der waal's equation
17	Unit 1	relationship between critical constants and vander waals constants
18	Unit 1	Root mean square,average & most probable velocitites
19	Unit 1	Qualitative discussion of the Maxwell's distribution of molecular velocities
20	Unit 1	collision numbers, mean free path and collision diameter
21	Unit 2	**A. Liquid States :** Intermolecular forces , structure of liquids, Liquid crystals
22	Unit 2	Difference between liquid crystal,solid & liquid
23	Unit 2	classification, structure of nematics and cholestric phases
24	Unit 2	Thermography, & seven segment cell
25	Unit 2	**B. Solid State :** Defination of space lattice, Unit cell
26	Unit 2	Laws of crystallography : (a) Law of constancy of interfacial angles,
27	Unit 2	(b) law of rationality of indices (c) law of symmetry
28	Unit 2	Symmetry elements in crystal, ionic solid structures, Radius Ratio effect
29	Unit 2	Coordination number, limitation of radius rule lattice defects
30	Unit 2	Revision of chapter after completion of unit
31	Unit 3	**Chemical Kinetics :** Chemical kinetics and its scope,rate of a reaction
32	Unit 3	Factors affecting rate : Conc, temp., solvent,light,catalyst,pressure
33	Unit 3	Dependence of rate on concentration,
34	Unit 3	Mathematical characteristic of simple chemical reaction: Zero order, First order, Second, Pseudo
35	Unit 3	half life and mean life, Determination of the order of reaction
36	Unit 3	Differential method, half life method
37	Unit 3	Determination of the order of reaction by integration method
38	Unit 3	study of chemical kinetics by polarimetry
39	Unit 3	study of chemical kinetics by spectrophotometery
40	Unit 3	Effect of temperature on rate of reaction
41	Unit 3	Arrhenius equation,Concept of activation energy
42	Unit 3	Simple collision theory, transition state theory
43	Unit 3	Revision of chapter after completion of unit
44	Unit 4	**Radioactivity and Nuclear Chemistry** : Natural and artificial radioactivity
45	Unit 4	radioactive radiations, detection and measurmentof radioactivity
46	Unit 4	Group displacement law of soddy
47	Unit 4	radioactive disintegration, nuclear reaction : nuclear fussion & nuclear fission
48	Unit 4	half life period, isotopes, isobars and isomers
49	Unit 4	application of radiochemistry
50	Unit 4	Revision of chapter after completion of unit
51	Unit 5	**A. Chemical Equilibrium:** Law of mass action, Equilibrium constant
52	Unit 5	Le chatelier's Principles

53	Unit 5	**B. Colloidal Solutions :** Classification, lyophilic and lyophobic colloids
54	Unit 5	Properties : kinetics, optical
55	Unit 5	Properties : electrical, coagulation
56	Unit 5	Hardy- Schulze rule, Gold number
57	Unit 5	emulsions, gels and sols
58	Unit 5	application of colloids
59	Unit 5	Revision of chapter after completion of unit

Maharaja Ranjit Singh College of Professional Sciences, Indore

Department of Biosciences

Lesson Plan - B. Sc. I Year (July 2018 - March 2019)

Subject - Chemistry - II Paper :Inorganic Chemistry

Teacher - Prof. Deepanshu Pandey

Day/Lecture	Unit	Topic
1	Unit 1	**(a) Atomic Structure :** Dual Nature of matter,idea of de Broglie matter waves
2	Unit 1	Heisenberg uncertainity principle, atomic orbital
3	Unit 1	Schrodinger wave equation,Significance of $\bar{Y}$ and $\bar{Y}$
4	Unit 1	quantum numbers, radial and angular wave functions
5	Unit 1	probability distribution curves, shapes of s,p,d, orbitals
6	Unit 1	Aufbau and pauli exclusion principles, Hund's multiplicity rule
7	Unit 1	Electronic configuration of the elements, effective nulcear charge
8	Unit 1	**(b) Periodic Properties :** Atomic and ionic radii , ionization energy
9	Unit 1	electron affinity , electronegativity- defination, methods of determination or evaluation
10	Unit 1	treands in periodic table and applications in predicting and explaing chemical behaviuor
11	Unit 1	Revision after the completion of the unit.
12	Unit 2	**(a) Chemical Bonding Part I :** Covalent Bond- Valence bond theory and its limitations
13	Unit 2	directional characteristic of covalent bond
14	Unit 2	various types of hybridization and shapes of simple inorganic molecules and ions
15	Unit 2	Valence shell electron pair repulsion (VSEPR) theory to NH3
16	Unit 2	Valence shell electron pair repulsion (VSEPR) theory to H3O,SF4,ClF3 and H2O
17	Unit 2	MO theory, Homonuclear and heteronuclear (CO and NO)4 diatomic molecules
18	Unit 2	multicenter bonding in elctron deficient molecules
19	Unit 2	bond strength and bond energy
20	Unit 3	**(a) Chemical Bonding Part II : Ionic Solids :** Ionic structures, radius ratio effect
21	Unit 3	coordination number, limitation of radius ratio rule
22	Unit 3	lattice defects,semi conductors, lattice energy
23	Unit 3	Born Haber cycle,
24	Unit 3	solvation energy & solubility of ionic solids
25	Unit 3	polarizing power and polarisability of ions
26	Unit 3	Fajan's rule, metallic bond-free electron, valence bond
27	Unit 3	Band theories
28	Unit 3	(b) **Weak Interaction**- Hydrogen bonding, van der waals forces
29	Unit 3	**Chemistry of Noble Gases:** chemical properties of the noble gases
30	Unit 3	chemistry of xenon
31	Unit 3	structure and bonding in xenon compounds
32	Unit 4	**1.S-Block Elements :** Comparative study Li and Mg
33	Unit 4	diagonal relationships, slient features of hydrides, solvation and complexation
34	Unit 4	tnedencies including their function in biosystemsan introduction to alkyls and aryls
35	Unit 4	**2.P-Block Elements I :** Comparative study Be and Al
36	Unit 4	diagonal relationship of groups 13-17 elements
37	Unit 4	Compounds like hydrides, oxides
38	Unit 4	oxyacids of groups 13-16
39	Unit 4	halide of groups 13-16
40	Unit 5	**p-Block Elements part II:** Hydrides of boron-diborane and higher boranes
41	Unit 5	Hydrides of boron-diborane and higher boranes
42	Unit 5	borazine borohydrides
43	Unit 5	Fullerenes, Fluorocarbons
44	Unit 5	silicates (structural principle)
45	Unit 5	tetrasulphur tetranitride
46	Unit 5	Basic properties of haolgens
47	Unit 5	Interhalogens and polyhalides
48	Unit 5	Revision after the completion of the unit.

Maharaja Ranjit Singh College of Professional Sciences, Indore

Department of Biosciences

Lesson Plan - B. Sc. I Year (July 2018 - March 2019)

Subject - Chemistry - III Paper :Organic Chemistry

Teacher - Prof. Deepanshu Pandey

Day/Lecture	Unit	Topic
1	Unit 1	**Structure and Bonding** : Hybridization
2	Unit 1	Bond lengths and bond angles, bond energy
3	Unit 1	localized and delocalized chemical bond
4	Unit 1	inclusion compounds,clatherates
5	Unit 1	charge transfer complexes
6	Unit 1	resonance,hyperconjugation
7	Unit 1	inductive, electromeric, mesomeric and steric effect
8	Unit 1	**Mechanism of Organic Reaction:** homolytic and heterolytic bond fission
9	Unit 1	Types of reagents- electrophiles and nucleophiles
10	Unit 1	Types of organic reaction, energy consideration
11	Unit 1	Methods of determination of reaction mechanism(active intermediate products)
12	Unit 1	isotopes effects, kinetics and stereochemical studies
13	Unit 1	Revision on completion of the unit
14	Unit 2	**Alkanes and cycloalkanes:** IUPAC nomenclature of branched and unbranched alkanes
15	Unit 2	classification of alkanes, isomerism in alkanes
16	Unit 2	methods of formation (Wurtz rxn, Kobe Rxn, Corey House Rxn, Decarboxylation)
17	Unit 2	physical and chemical reaction of alkanes
18	Unit 2	conformation of alkanes
19	Unit 2	mechanism of free radical halogenation of alkanes
20	Unit 2	**cycloalkanes-**nomenclature, methods of formation,
21	Unit 2	chemical reaction, Baeyer strain theory and its limitation
22	Unit 2	Theory of strainless rings
23	Unit 2	The case of cyclopropane ring : Banana bonds
24	Unit 2	conformation of cycloalkanes
25	Unit 2	Revision on completion of the unit
26	Unit 3	**Alkene, Cycloalkenes,Dienes :** Nomenclature of alkenes
27	Unit 3	methods of formation - mechanism of dehydration of alcohols and dehydrogenation of alkyl halides
28	Unit 3	ragioselectivity in alcohol dehydration
29	Unit 3	The saytzeff rule
30	Unit 3	Hofmann elimination
31	Unit 3	physical properties and relative satbilities of alkenes
32	Unit 3	Chemical reaction of alkenes- mechanism involved in hydrogenation
33	Unit 3	electrophilic and free radical addition
34	Unit 3	Markownikoff's rule
35	Unit 3	hydroboration- oxidation , oxymercuration reduction
36	Unit 3	Epoxidation, ozonolysis
37	Unit 3	polymerization of alkenes
38	Unit 3	substitution of allylic and vinylic positions
39	Unit 3	application of ethylene and propene
40	Unit 3	Methods of formation, conformation and chemical reactions of cycloalkanes
41	Unit 3	Nomenclature and classification of dienes: isolated, conjugated and cumulated dienes
42	Unit 3	structure of allenes and butadiene
43	Unit 3	methods of formation
44	Unit 3	polymerisation
45	Unit 3	Chemical reaction- 1,2 and 1,4 addition
46	Unit 3	Diels- Alder reaction
47	Unit 3	Revision on completion of the unit
48	Unit 4	**Alkynes and Alkyl Halides :** Nomenclature, structure and bonding of alkynes
49	Unit 4	Methods of formation, chemcial reactions
50	Unit 4	acidity of alkynes, Mechanism of electroplilic and nucleophilic addition reaction
51	Unit 4	hydroboration oxidation , metal- ammonia reduction- oxidation
52	Unit 4	polymerization of alkynes

53	Unit 4	Nomenclature and classification of alkyl halides
54	Unit 4	methods of formation, chemical reactions
55	Unit 4	Mechanism of nucleophilic substitution reaction of alkyl halides
56	Unit 4	SN 1 and SN 2 reaction with energy profile diagrams
57	Unit 4	Elimination reaction
58	Unit 4	Polyhalogen compounds : methods of preperation
59	Unit 4	properties of chloroform and carbon tetrachloride
60	Unit 4	Revision on completion of the unit
61	Unit 5	**Stereochemistry of Organic compounds :** Concept of isomerism
62	Unit 5	types of isomerism
63	Unit 5	optical isomerism, elements of symmetry
64	Unit 5	moleculare chirality
65	Unit 5	enantionmers, stereogenic centre
66	Unit 5	optical activity, properties of enantiomers
67	Unit 5	chiral and achiral molecules with two stereogenic centres
68	Unit 5	diastereomers, threo and erthro enantiomers
69	Unit 5	inversion,retention and racemization
70	Unit 5	Relative and absolute configuration, sequence rule
71	Unit 5	D & L and R & S systems of nomenclature
72	Unit 5	Geometrical isomerism - determination of configuration of geometric isomers
73	Unit 5	E & Z system of nomenclature
74	Unit 5	geometric isomerism in oximes and alicyclic compounds
75	Unit 5	Revision on completion of the unit

Day/Lecture	Unit
1	
2	
3	
4	
5	
6	
7	
8 to 18	
19 to 20	
21	
22	
23 to 25	
26 to 32	

Maharaja Ranjit Singh College of Professional Sciences, Indore

Department of Biosciences

Lesson Plan - B. Sc. I Year (July 2018 - March 2019)

Subject - Chemistry Practical

Teacher - Prof. Deepanshu Pandey

Topic
Physical Chemistry : An introduction
(A) Any one experiment :
(i) Determination of melting point
(ii) Determination of boiling point
(iii) Weighing and preparation of solution
(B) Any one experiment :
(i) Determination of surface tension/percentage composition of given liquid mixture using surface tension method
(ii) Determination of viscocity/ percentage composition of given liquid mixture using viscocity method.
Inorganic Chemistry : An introdution
(i) Inorganic mixture analysis
Mixture analysis for 2 cation and 2 anions
(ii) Separation of cations by paper chromatography
Organic Chemistry (Any two)
(i) Crystallization
(ii)Sublimation
(iii) Detection of elements
(iv) Identification of functional group

Maharaja Ranjit Singh College of Professional Sciences, Indore

Department of Chemical Science

Lesson Plan - B.Sc. II Year (July 2018 - June 2019)

Subject - Chemistry Paper I(Physical Chemistry)

Teacher - Prof. Seema Shintre

Day/Lecture	Unit	Topic
	1	**Thermodynamics**
1		Basic concepts - system,surrounding, Extensive and intensive properties, types of process,
2		Exothermic and Endothermic process, reversible and irreversible process, Internal energy
3		First law of thermodynamics, Enthalpy, Heat and work
4		Molar heat capacity, Joule Thomson effect and its coefficient
5		Expansion of ideal gases for isothermal and adiabatic process
6		Second law of thermodynamics, Carnot cycle
7		Carnot theorem, thermodynamic scale of temprature
8		Concept of Entropy and entropy change in Carnot cycle
9		Entropy change of ideal gas in term of P &T and V &T
10		Physical significance of entropy , Claussius inequility
11		Entropy of mixing, entropy and probability
12		Third law of thermodynamics (**Nernst heat theoram**), work function
13		Concept of Free energy and Gibb's Helmholtz equation in term of work function and internal energy
		and in term of Free energy and enthalpy
		Thermochemistry
14		Hess's law and Heat of reaction
15		Bomb colorimeter, Heat of neutralization
16		Bond energy and its factors, Kirchaff's equation
	2	**Phase Equilibrium**
17		Statement and the meaning of terms: phase, component and the degree of freedom
18		Thermodynamic derivation of the Gibbs phase rule
19		One component system: water system, CO_2 system
20		Sulphur system
21		Two component system: solid liquid equilibrium, simple eutectic system: Bi-Cd system
22		Pb-Ag system and desilverisation of lead
		Solid solution
23		Type B system: Zn-Mg system
24		NaCl-H_2O system, copper sulphate water system
		Liquid liquid mixture
25		Raoult's law and Henry's law
26		Ideal and non-ideal solutions
27		Azeotrops: HCl-H_2O and ethanol water system
		Partial miscible liquids
28		Phenol-water, trimethylamine-water and nicotine-water system
29		Lower and upper consolute temperature, steam distillation
30		Nernst distribution law: thermodynamic derivation, application.
	3	**Electrochemistry-I**
31		Electrical transport, conduction in metal and electrolyte solutions
32		Resistance, conductance,Specific and equivalent conductivity
33		Measurment of equivalent conductance, effect of dilution on conductivity
34		Migration of ions and Kohlrausch law and application
35		Arrhenius theory of electrolyte dissociation and its limitations
36	.	Weak and strong electrolytes, Ostwald's dilution law
37		Debye Huckel theoryad DHO equation
38		Transport number, Hittorf method
39		Moving boundary method
	4	**Electrochemistry-II**
40		Basic concept and Reversible electrodes
41		Nernst equation, referance electrode
42		Standard hydrogen electrode(Gas electrode)
43		Calomel electrode(metal insoluble salt electrode)
44		Types of electrochemical cell
45		Application of EMF
46		Electrochemical series and its significance
47		Potentiometric titration, concentration cell with and without transport
48		Relation between pH, pOH and pkw, Buffer solution and its type
49		Henderson's equation, salt hydrolysis- salt of strong acid and strong base

50		salt of strong acid and weak base
51		salt of weak acid and strong base
52		salt of weak acid and weak base
	5	**Surface chemistry**
53		Adsorption, absorption, types of adsorption
54		adsorption of gases and liquid in solid adsorbate
55		Freundlich and langmuir adslorption isotherm
56		Surface area and determination of surface area
57		Catalysis- Characteristics of catalyzed reactions, classification of catalysis
58		Application of catalysts, miscellaneous examples

Maharaja Ranjit Singh College of Professional Sciences, Indore

Department of Chemical Science

Lesson Plan - B.Sc. II Year (July 2018 - June 2019)

Subject - Chemistry Paper II (Inorganic Chemistry)

Teacher - Prof. Seema Shintre

Day/Lecture	Unit	Topic
	1	**Chemistry of elements of first transition series**
1		Characteristics properties of d-block elements- electronic configuration, metallic character
2		variable oxidation state, colour formation,atomic and ionic radii
3		complex formation, magnetic property
4		Catalytic property, formation of interstitial compounds
5		Binary compounds- oxides
6		sulphides and halides, carbides
7		complexes illustrating relative stability of their oxidation states, co-ordination number and geometry
	2	**Chemistry of elements of second and third transition series**
8		General introduction, characteristics- electronic configuration, atomic and ionic radius
9		Lanthenide contraction, variable oxidation states
10		Magnetic nature, term symbol, L-S coupling
11		magnetic succeptibility and its determination by Gouy method
12		Spectral nature, stereochemistry
	3	**Co-ordination compounds**
13		General introduction, Werner's co-ordination theory and its experimental verification
14		Nomenclature of co-ordination compounds
15		Sigdwick electronic concept of co-ordinate bond, Effective atomic number concept
16		Chelates, inner metallic complex
17		Isomerism in co-ordination compounds, structural isomerism
18		stereoisomerism- geometrical and optical isomerism
19		Valance bond theory of transition metal complex- octahedral complex
20		Tetrahedral and square planner complex
		Oxidation and Reduction
21		oxidation and Reduction, redox reaction, singal electrode potential
22		redox cycle, redox stability of water- Frost diagram
23		Latimer and Pourbaix diagrams.
24		Basic principle in the extraction of metals
	4	**(a) Chemistry of Lanthanide elements**
25		electronic structure, oxidation states
26		ionic radii and lanthanide contraction
27		complex formation occurrence and isolation
28		lanthanide compounds
		(b) Chemistry of Actinides
29		General features and chemistry of actinides
30		chemistry of Np, Pu and Am from U, Similarities between lanthanides and actinides
	5	**Acids and Bases**
31		Arrhenius concept, Bronsted-Lowry concept
32		Solvent system and Lewis concepts of acids and bases
33		Lux-Flood theory, Physical properties of a solvent
34		Types of solvents and their general characteristics
35		Reactions in non-aqueous solvents with reference to liquid NH_3
36		Reactions in non-aqueous solvents with reference to liquid SO_2

Mahara

Day/Lecture	Unit
	1
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
	2
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	
27	
28	
29	

30	
31	
32	
	3
33	
34	
35	
36	
37	
38	
39	
40	
41	
42	
43	
44	
45	
46	
	4
47	
48	
49	
50	
51	
52	
53	
54	
55	
56	
57	
58	
	5
59	
60	
61	
62	

63	
64	
65	
66	
67	
68	
69	
70	

ıja Ranjit Singh College of Professional Sciences, Indore

Department of Chemical Science

Lesson Plan - B.Sc. II Year (July 2018 - June 2019)

Subject - Chemistry Paper III (Organic Chemistry)

Teacher - Prof. Seema Shintre

Topic
Electromagnetic Spectrum: Absorption spectra
basic concept of spectroscopy
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
IR absorption spectroscopy- Molecular vibrations
Hookes law, selection rules
intensity and position of IR bands
Measurement of IR spectrum, finger print region
Characteristic absorption of various functional groups
Interpretation of IR spectra of simple organic compounds
(a) Alcohols
Classification and nomenclature
Monohydric alcohols- nomenclature, methods of formation
reduction of aldehydes,Ketones,carboxylic acids and esters
Hydrogen bonding, acidic nature
reaction of alcohols
Dihydric alcohols- nomenclature, methods of formation
chemical reactions of vicinal glycols
oxiidative cleavage and pinacol-pinacolone rearrangement
Trihydric alcohols- Nomenclature, methods of formation
chemical reactions of glycerols
(b) Phenols
Nomenclature, structure and bonding
Preparations of phenols, physical properties and acidic characters
comparative acidic strength of alcohols and phenols
resonance stablization of phenoxide ions, reactions of phenols
electrophilic aromatic substitutions, acylation and arboxylation

mechanism of Fries rearrangement, Claisen rearrangement
Gatermann synthesis, Hauben- Hoesche reaction
Lederer Manasse reaction and Reimer Teiman reaction
Aldehydes and Ketones
Nomenclature, structure of the carbonyl group
synthesis of aldehydes and ketones - synthesis of aldehyde from acid chlorides
synthesis of aldehyde and ketone from 1,3 dithianes
synthesis of ketones from nitrilles and carboxylic acids
physical properties
mechanism of reactions- Aldol condensation and benzoin condensation
Perkin reaction and Knoevengel condensations
condensation with ammonia nd its derivatives
Wittig reaction and Mannich reaction
Use of acetals as protecting groups , oxidation of aldehydes
Baeyer-Villiger oxidation of ketones, cannizaro reaction
MPV, Clemmenson , Wolf Kischner reaction
$LiAlH_4$ and $NaBH_4$ reduction, Helogination
An introduction to alfa, beta unsaturated aldehyde and ketones
(a)Carboxylic acids
Nomenclature ,structure and bonding
physical properties and acidity of carboxylic acids
Preparation and reactions of carboxylic acids
HVZ reaction, synthesis of acid chloride, esters and amides
reduction of carboxylic acids, Mechanism of decarboxylation
Methods and chemical reactions of halo acids, hydroxyl acid
Malic acid, tartaric acid , citric acids
Methods and chemical reactions of unsaturated monocarboxylic acids,
Dicarboxylic acids
(b) Ether
Nomenclature of ether and methods of formation
physical properties and chemical reactions
Cleavage and auto oxidation, Zeisels method
Organic compounds of nitrogen
Preparation of nitro-alkanes and nitro arene
Chemical reactions of nitro-alkanes
Mechanism of nucleophilic substitution in nitro-arenes
Reductions in neutral acidic and alkaline media

Haloarenes: Reactivity, Structure and nomenclature of amines
Physical properties, stereochemistry of amines
Seperation of mixture of primary,secondary and tertiary amines, basicity of amines
Amine salts as phase transfer catalyst, Preparation of alkyl and aryl amines
Gabrial Phthalimide reaction, Hoffmann-Bromamide reaction
Reaction of amines, electrophilic aromatic substitution in aryl amines
Reactions of amines with nitrous acid, Synthetic transformations of aryl diazonium salt
Azo coupling

Maharaja Ranjit Singh College of Professional Sciences, Indore

Department of Chemical Sciences

Lesson Plan - B.Sc. II Year (July 2018 - June 2019)

Subject - Chemistry Practical

Teacher - Prof. Seema Sintre

Day/Lecture	Unit	Topic
		Inorganic Chemistry
1		Analysis of inorganic mixture containing five radicals with at least on interfering radicals
2		Determination of acetic acid in commercial vinager using NaOH
3		Redox Titration
4		Estimation of hardness of water by EDTA
		Physical Chemistry
5		Determination of transition temperature of given substance by thermometric method
6		To determine the enthalpy of neutralization of strong acid strong base
7		Verification of Beer's- Lambert law
8		To study the phase diagram of two component system by cooling curve method
		Organic Chemistry
9		Identification of an organic compound through the functional group analysis, determination
		of melting point and preparation of suitable derivatives.
10		Use of Paper chromatography/ Thin layer chromatography:
		Determination of Rf values, seperation and identification of organic compounds.
11	a	Seperation of green leaf pigments
12	b	Seperation of dyes

Maharaja R

Maharaja Ranjit Singh College of Professional Sciences, Indore

Department of Chemical Science

Lesson Plan - B.Sc. V Sem Chemistry (July 2018 - Dec 2018)

Subject - Chemistry

Teacher - Dr. Lal Kumar

Day/Lecture	Unit	Topic
1	**I**	**Organic Compounds of Nitrogen:**
2	I	Preparation, properties and chemical reactions of nitroalkanes and nitroarenes.
3	I	Mechanism of nucleophilic substitution in nitroarenes and their reduction in acidic neutral and alkaline media, picric acids.
4	I	Halonitroarenes; structure and nomenclature, and their activity.
5	I	Amines structure, and nomenclature, physical properties and stereochemistry, separation of mixture of primary, secondary and tertiary amines.
6	I	Structural features affecting basicity of amines. Amine salts as phase transfer catalysts.
7	I	Preparation of alkyl and aryl amines (reduction of nitro compounds, nitriles), reductive amination of aldehydic and ketonic compounds,
8	I	Gabriel – phthalamide reaction, Hoffmann bromamide reaction, Reaction of amines, electrophilic aromatic substitution in aryl amines, reaction of amines with nitrous acid synthetic transformation of aryl diazonium salts, azo coupling.
9	**II**	**A. Carbohydrates-I**
10	II	Classification and nomenclature
11	II	monosaccharides
12	II	Mechanism of Osazone formation
13	II	Inter conversion of glucose into fructose
14	II	Ascending and descending series in aldose
15	II	Configuration of monosaccharides
16	II	Stereo isomers of erythro and theo sugars
17	II	Conversion of glucose into mannose
18	II	Glycosides, determination of the size of the ring of monosachharides
19	II	Ring structure of D(+) glucose
20	II	Mechanism of mutarotation
21	II	Structure of ribose and deoxyribose
22	II	**B. Carbohydrates-II**
23	II	Disaccharides introductory idea of maltose, sucrose, and lactose (excluding structure)
24	II	Polysaccharides introductory idea of starch and cellulose(Excluding Structure)
25	II	Reducing and non-reducng sugars
26	**III**	**A. Photochemistry**
27	III	Electromagnetic radiation, range of different regions of the spectrum

28	III	different expression units for energy
29	III	wavelength and frequency
30	III	interaction of radiation with matter
31	III	difference between thermal and photochemical process
32	III	Law of photochemistry
33	III	Grothus Draper Law
34	III	Stark-Einstein Law
35	III	Beer-Lambert Law
36	III	Electronic Transition
37	III	Jablonski Diagram depicting various quantum yield
38	III	**B. UV Spectroscopy**
39	III	Electronic Excitation
40	III	Elementary Idea of instrument used
41	III	Application to organic molecules
42	III	Woodward-Fieser rule for determining lemda max of enes, polyenes and alpha,beta-unsaturated carbonyl compounds
43	**IV**	**A. Bioinorganic Chemistry-I**
44	IV	Essential and trace element in biological processes
45	IV	Metalloporphyrins with special reference to haemoglobin and myoglobin
46	IV	Biological role of alkali and alkaline earth metal ions with special reference of Ca2+.
47	IV	**B. Bioinorganic Chemistry-II**
48	IV	Role of metal ions in biological process, nitrogen fixation
49	IV	oxygen uptake proteins, cytochromes and ferredoxins.
50	**V**	**A. Hard and Soft Acids and Bases(HSAB)**
51	V	Classification of acids and bases as hard and soft
52	V	Pearson's HSAB Concept, Symbiosis
53	V	**B. Analytical Chemistry**
54	V	Errors, their classification, minimisation of errors, precision and accuracy,
55	V	Gravimetric estimation: concept, method and precautions
56	V	Gravimetric estimation of barium and copper
57	V	**C. Inorganic Polymer**
58	V	Intoduction, scope of inorganic polymers
59	V	special characteristics, Classification and their applications
60	V	Structure and nature of bonding in Silicones and triphosphonitrilic chloride

Maharaja Ranjit Singh College of Professional Sciences, Indore

Department of Chemical Science

Lesson Plan - B.Sc. V Sem Chemistry (July 2018 - Dec 2018)

Subject - Chemistry Practical

Teacher - Dr. Lal Kumar

Day/Lecture	Unit	Topic
1	**I**	**Inorganic Chemistry**
2	I	To separate and identify inorganic mixture having five radicals with at least one interfering radical
3	I	To separate and identify inorganic mixture having five radicals with at least one interfering radical
4	I	To separate and identify inorganic mixture having five radicals with at least one interfering radical
5	I	**Gravimetric Analysis**
6	I	To estimate barium as a barium sulphate
7	II	**Organic Chemistry Preparation**
8	II	A. Acetylation
9	II	B. Benzoylation
10	II	C. meta-dinitrobenzene
11	II	D. Picric Acid

Maharaja Ranjit Singh College of Professional Sciences, Indore

Department of Chemical Science

Lesson Plan - B.Sc. VI Sem Chemistry (Jan 2019 - June 2019)

Subject - Chemistry

Teacher - Dr. Lal Kumar

Day/Lecture	Unit	Topic
1	**I**	**A. Amino Acids**
2	I	Classification of Amino Acid
3	I	Structure, stereochemistry of amino acids
4	I	Acid base behaviour, isoelectric point
5	I	General methods of preparation and properties of alpha-amino acids
6	I	Proteins and peptides. Introduction to peptides linkage,
7	I	End group analysis, classification, properties and structure of proteins (primary, secondary and tertiary).
8	I	**B. Nucleic acids:** Introduction of nucleic acids and constituents of nucleic acid,
9	I	Ribonucleosides, Ribonucleotides,
10	I	Double helical structure of DNA
11	I	**C. Elementary idea of Fats, Oils & Detergents:**
12	I	Natural fats, edible and industrial oils of vegetable origin, common fatty acids, glycerides,
13	I	Hydrogenation of unsaturated oils,
14	I	Saponification value, iodine value, acid value.
15	**II**	**A. Organometallic Chemistry:**
16	II	Synthesis; structure and bonding in metal carbonyl complexes,
17	II	Metal olefin complexes and metal alkyne complexes.
18	II	Oxidative addition reactions.
19	II	**B. Organometallic Compounds:**
20	II	Organomagnesium Compound -
21	II	Grignard Reagent and Organolithium Compounds,
22	II	Methods of preparation, structure and synthetic applications.
23	**III**	**Magnetic properties of transition metal complexes:**
24	III	Magnetic moment
25	III	(spin only and with L-S coupling),
26	III	orbital contribution magnetic moment.
27	III	**B. Electronic spectra of transition metal complexes:**
28	III	Spectroscopic ground and excited states,
29	III	Types of electronic transitions,
30	III	Selection rules for d-d transitions,

31	III	Orgel-energy level diagram for d1 to d9 states.
32	III	**C. Water Analysis:**
33	III	Hardness, types of hardness,
34	III	Acidity and alkalinity, BOD, COD and DO.
35	**IV**	**A. Infrared spectroscopy :**
36	IV	Statement of the Born-Oppenheimer approximation,
37	IV	Rotational spectrum of diatomic molecules.
38	IV	Energy levels of a rigid rotator,
39	IV	Selection rule, intensity of absorption bands,
40	IV	Maxwell- Boltzmann distribution and
41	IV	Population of energy levels.
42	IV	B. Energy levels of simple harmonic oscillator,
43	IV	selection rules,
44	IV	Pure vibrational spectrum,
45	IV	Intensity and qualitative relation of force constant and bond energies,
46	IV	Degree of freedom and
47	IV	Modes of vibration,
48	IV	vibrational frequencies of different functional groups.
49	IV	**C. Raman Spectroscopy:**
50	IV	Concept of polarizability,
51	IV	Pure rotational and Pure vibrational Raman spectra of diatomic molecules.
52	IV	Selection rules, application of Raman spectrum.
53	**V**	**A. NMR Spectroscopy**
54	V	Principle and Instrumentation,
55	V	NMR active nucleus,
56	V	Chemical shift, spin-spin coupling,
57	V	Spectrum of ethanol and ethanal.
58	V	**B. Surface Phenomena and Catalysis:**
59	V	Adsorption of gases and liquids on solid adsorbent,
60	V	Freundlich and Langmuir adsorption isotherms,
61	V	Determination of surface area,
62	V	Characteristics and mechanism of heterogeneous catalysis.

Maharaja Ranjit Singh College of Professional Sciences, Indore

Department of Chemical Science

Lesson Plan - B.Sc. VI Sem Chemistry (Jan 2019 - June 2019)

Subject - Chemistry Practical

Teacher - Dr. Lal Kumar

Day/Lecture	Unit	Topic
1	**I**	**Organic Chemistry**
2	I	To separate and identify organic mixture having two solid also prepare their derivatives
3	I	To separate and identify organic mixture having two solid also prepare their derivatives
4	I	To separate and identify organic mixture having two solid also prepare their derivatives
5	I	To separate and identify organic mixture having two solid also prepare their derivatives
6	**II**	**Physical Instrumentation**
7	II	A. Job's Method
8	II	B. Mole-ratio method
9	**III**	**Inorganic Chemistry**
10	III	Effluent Analysis: to identify cations and anions in given water samples.
11	III	Water Analysis:To determine the dissolve oxygen in given water sample in ppm units.
12	III	To determine the hardness of water samples.