

**Maharaja Ranjit Singh College of Professional Sciences, Indore**

Department of Biosciences

Lesson Plan - B. Sc. I Year (July 2017 - March 2018)

**Subject - Chemistry - I Paper : Physical Chemistry**

**Teacher - Prof. Deepanshu Pandey**

Day/Lecture	Unit	Topic
1	Unit 1	<b>A. Mathematical Concept :</b>
2	Unit 1	Logarithm relations (rules & types)
3	Unit 1	Use of log table and antilog table in calculation
4	Unit 1	Curve sketching (Straight 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/ relevant functions
9	Unit 1	Factorials
10	Unit 1	Probability
11	Unit 1	Revision of chapter after completion of unit
12	Unit 1	<b>B. Gaseous States and Molecular Velocities :</b>
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 velocities
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	<b>A. Liquid States :</b> 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>B. Solid State :</b> 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	<b>Chemical Kinetics :</b> 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 spectrophotometry
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	<b>Radioactivity and Nuclear Chemistry :</b> Natural and artificial radioactivity
45	Unit 4	radioactive radiations, detection and measurement of 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	<b>A. Chemical Equilibrium:</b> Law of mass action, Equilibrium constant
52	Unit 5	Le chatelier's Principles
53	Unit 5	<b>B. Colloidal Solutions :</b> 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
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# Maharaja Ranjit Singh College of Professional Sciences, Indore

Department of Biosciences

Lesson Plan - B. Sc. I Year (July 2017 - March 2018)

**Subject - Chemistry - II Paper :Inorganic Chemistry**

**Teacher - Prof. Deepanshu Pandey**

Day/Lecture	Unit	Topic
1	Unit 1	<b>(a) Atomic Structure :</b> Dual Nature of matter, idea of de Broglie matter waves
2	Unit 1	Heisenberg uncertainty principle, atomic orbital
3	Unit 1	Schrodinger wave equation, Significance of $\Psi$ and $\Psi^2$
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 nuclear charge
8	Unit 1	<b>(b) Periodic Properties :</b> Atomic and ionic radii, ionization energy
9	Unit 1	electron affinity, electronegativity- definition, methods of determination or evaluation
10	Unit 1	trends in periodic table and applications in predicting and explaining chemical behaviour
11	Unit 1	Revision after the completion of the unit.
12	Unit 2	<b>(a) Chemical Bonding Part I :</b> 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 NH <sub>3</sub>
16	Unit 2	Valence shell electron pair repulsion (VSEPR) theory to H <sub>2</sub> O, SF <sub>4</sub> , ClF <sub>3</sub> and H <sub>2</sub> O
17	Unit 2	MO theory, Homonuclear and heteronuclear (CO and NO) <sub>2</sub> diatomic molecules
18	Unit 2	multicenter bonding in electron deficient molecules
19	Unit 2	bond strength and bond energy
20	Unit 3	<b>(a) Chemical Bonding Part II : Ionic Solids :</b> 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>(b) Weak Interaction-</b> Hydrogen bonding, van der Waals forces
29	Unit 3	<b>Chemistry of Noble Gases:</b> chemical properties of the noble gases
30	Unit 3	chemistry of xenon
31	Unit 3	structure and bonding in xenon compounds
32	Unit 4	<b>1.S-Block Elements :</b> Comparative study Li and Mg
33	Unit 4	diagonal relationships, salient features of hydrides, solvation and complexation
34	Unit 4	trends including their function in biosystems an introduction to alkyls and aryls
35	Unit 4	<b>2.P-Block Elements I :</b> 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	<b>p-Block Elements part II:</b> 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 halogens
47	Unit 5	Interhalogens and polyhalides
48	Unit 5	Revision after the completion of the unit.
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**Maharaja Ranjit Singh College of Professional Sciences, Indore**

Department of Biosciences

Lesson Plan - B. Sc. I Year (July 2017 - March 2018)

**Subject - Chemistry - III Paper :Organic Chemistry**

**Teacher - Prof. Deepanshu Pandey**

Day/Lecture	Unit	Topic
1	Unit 1	<b>Structure and Bonding</b> : Hybridization
2	Unit 1	Bond lengths and bond angles, bond energy
3	Unit 1	localized and delocalized chemical bond
4	Unit 1	inclusion compounds, clathrates
5	Unit 1	charge transfer complexes
6	Unit 1	resonance, hyperconjugation
7	Unit 1	inductive, electromeric, mesomeric and steric effect
8	Unit 1	<b>Mechanism of Organic Reaction:</b> 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	<b>Alkanes and cycloalkanes:</b> IUPAC nomenclature of branched and unbranched alkanes
15	Unit 2	classification of alkanes, isomerism in alkanes
16	Unit 2	methods of formation ( Wurtz rxn, Kober 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	<b>cycloalkanes</b> -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	<b>Alkene, Cycloalkenes, Dienes</b> : Nomenclature of alkenes
27	Unit 3	methods of formation - mechanism of dehydration of alcohols and dehydrogenation of alkyl halides
28	Unit 3	regioselectivity in alcohol dehydration
29	Unit 3	The saytzeff rule
30	Unit 3	Hofmann elimination
31	Unit 3	physical properties and relative stabilities 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	<b>Alkynes and Alkyl Halides</b> : Nomenclature, structure and bonding of alkynes
49	Unit 4	Methods of formation, chemical reactions
50	Unit 4	acidity of alkynes, Mechanism of electrophilic 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 preparation
59	Unit 4	properties of chloroform and carbon tetrachloride
60	Unit 4	Revision on completion of the unit
61	Unit 5	<b>Stereochemistry of Organic compounds</b> : Concept of isomerism
62	Unit 5	types of isomerism
63	Unit 5	optical isomerism, elements of symmetry
64	Unit 5	molecular chirality
65	Unit 5	enantiomers, 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 erythro 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

**Maharaja Ranjit Singh College of Professional Sciences, Indore**

Department of Biosciences

Lesson Plan - B. Sc. I Year (July 2017 - March 2018)

**Subject - Chemistry Practical****Teacher - Prof. Deepanshu Pandey**

Day/Lecture	Unit	Topic
1		<b>Physical Chemistry : An introduction</b>
		<b>(A) Any one experiment :</b>
2		(i) Determination of melting point
3		(ii) Determination of boiling point
4		(iii) Weighing and preparation of solution
		<b>(B) Any one experiment :</b>
5		(i) Determination of surface tension/percentage composition of given liquid mixture using surface tension method
6		(ii) Determination of viscosity/ percentage composition of given liquid mixture using viscosity method.
7		<b>Inorganic Chemistry : An introduction</b>
8 to 18		(i) Inorganic mixture analysis Mixture analysis for 2 cation and 2 anions
19 to 20		(ii) Separation of cations by paper chromatography
		<b>Organic Chemistry (Any two)</b>
21		(i) Crystallization
22		(ii) Sublimation
23 to 25		(iii) Detection of elements
26 to 32		(iv) Identification of functional group

**Maharaja Ranjit Singh College of Professional Sciences, Indore**

Department of Chemical Science

Lesson Plan - B.Sc. III sem (July 2017 - Dec 2017)

Subject - Chemistry Paper I (Chemistry)

Teacher - Prof. Seema Shintre

Day/Lecture	Unit	Topic
	1	<b>Arenes and Aromaticity</b>
1		Structure of Benzene, molecular formula and Kekulé structure.
2		Stability and carbon-carbon bond lengths of benzene, resonance structure.
3		MO picture, Aromaticity, The Huckel rule.
4		Aromatic electrophilic substitution, mechanism of nitration
5		mechanism of halogenation, sulphonation
6		mercuration and Friedel-Crafts reaction and energy profile diagram.
		<b>Aryl Halide</b>
7		Methods of formation and reactions of aryl halide
8		Mechanism of nucleophilic aromatic substitution, synthesis and uses of DDT
9		Synthesis and uses of BHC and Freon.
	2	<b>(a) Alcohols: classification and nomenclature</b>
10		Monohydric alcohol: nomenclature, methods of formation by reduction of aldehyde, ketones
11		Carboxylic acid and esters, acidic nature
12		reaction of alcohols
13		Dihydric alcohol: Nomenclature, methods of formation, chemical reactions of vicinal glycols
14		Oxidative cleavage and pinacol-pinacolone rearrangement
15		Trihydric alcohols- Nomenclature and methods of formation
16		Chemical reaction of glycerol
		<b>(b) Phenols</b>
17		Nomenclature, structure and methods of formation
18		Acidic character, comparative acidic strength of alcohols and phenols
19		Stabilization of phenoxide ion by resonance, acylation and carboxylation mechanism of Fries rearrangement
20		Gatterman synthesis, Hauben-Hoesch reaction
21		Lederer-Manasse reaction and Reimer-Tiemann reaction.
	3	<b>Chemistry of elements of I transition series:</b>
22		Characteristics properties of d-block elements
23		Properties of the elements of the first transition series
24		binary compounds such as carbides, sulphides
25		binary compounds such as Oxides
26		complexes illustrating relative stability of their oxidation states
27		co-ordination number and geometry
		<b>Chemistry of elements of II and III transition series:</b>
28		General characteristics comparative study of II and III transition series: ionic radii, Oxidation states
29		Magnetic behavior, Spectral properties
30		Stereochemistry
	4	<b>Co-ordination compounds</b>
31		IUPAC Nomenclature, isomerism
32		EAN concept, Chelates
33		VBT of transition metal complexes and its limitation
34		Crystal field theory, Crystal field stabilization energy
35		chemical series, limitation of CFT
		<b>Thermochemistry: Standard state, standard enthalpy of formation</b>
36		Hess's law of heat summation and its application
37		Heat of reaction at constant pressure and constant volume
38		Enthalpy of neutralization
39		Second law of thermodynamics, Carnot cycle
40		Carnot cycle efficiency, Carnot theorem, Thermodynamic scale of temperature.
	5	<b>Thermodynamics: concept of entropy</b>
41		entropy, entropy as a function of P & T
42		entropy change in physical change, Clausius inequality

43		entropy as criteria of spontaneity and equilibrium, mixing of gases
44		entropy change in ideal gases
45		Third law of thermodynamics: Nernst heat theorem, statement and concept of residual entropy
46		evaluation of absolute entropy from heat capacity data, Gibbs and Helmholtz function
47		Gibbs function and Helmholtz function as a thermodynamic quantities
48		A and G as a criteria for thermodynamic equilibrium and spontaneity , their advantage over entropy change
49		relative variation of G&A with P,V,T
50		<b>Buffer:</b> Mechanism of buffer action, Henderson-Hazel equation
51		Hydrolysis of salts

**Maharaja Ranjit Singh College of Professional Sciences, Indore**

Department of Chemical Sciences

Lesson Plan - B.Sc. III Sem (July 2017-Dec-2017)

Subject - Chemistry Practical

Teacher - Prof. Seema Shintre

Day/Lecture	Unit	Topic
		<b>Inorganic Chemistry</b>
1		Calibration of the fractional weights, pipettes and burettes
2		Preparation of standard solutions. Dilution of 0.1M to 0.01 M solutions
		<b>Qualitative analysis: Volumetric analysis</b>
3	a	Determination of acetic acid in commercial vinegar using NaOH.
4	b	Determination of alkali content- antacid tablet using HCl.
5	c	Estimation of calcium content in chalk as calcium oxalate by permanganometry.
6	d	Estimation of hardness of water by EDTA.
		<b>Complex compound preparation:</b>
7	1	Diaquabis(methyl acetoacetato) nickel (II)
8	2	Diaquabis(methyl acetoacetato) Cobalt (II)
9	3	Bis (methyl acetoacetato) copper (II) monohydrate
10	4	Potassium chlorochromate(IV)
11	5	Tetraamminecopper(II) sulphate monohydrate
12	6	Hexaaminenickel(II) chloride
		<b>Organic chemistry</b>
		<b>Thin layer chromatography</b>
		Determination of R <sub>f</sub> values and identification of organic compounds
13	a	Separation of green leaf pigments (spinach leaves may be used)
14	b	Preparation and separation of 2,4- dinitrophenylhydrazones of acetone, 2-butanone, hexane-2, and 3-one using toluene and light petroleum (40:6)
15	c	Separation of a mixture of dyes using cyclohexane and ethylacetate. (8:5:1.5)
		<b>Paper chromatography</b>
		Determination of R <sub>f</sub> values and identification of organic compounds
16	a	Separation of mixture of phenylalanine and glycine, alanine and aspartic acid. spray reagent ninhydrin
17	b	Separation of mixture of DL-alanine, glycine and L-leucine using n-butanol:acetic acid :water(4:1:5)
18	c	Separation of monosaccharides- a mixture of D-galactose and D-fructose.

**Maharaja Ranjit Singh College of Professional Sciences, Indore**

Department of Chemical Science

Lesson Plan - B.Sc. IV sem (Jan 2018 - June 2018)

Subject - Chemistry Paper I (Chemistry)

Teacher - Prof. Seema Shintre

Day/Lecture	Unit	Topic
	1	<b>Phase Equilibrium</b>
1		Statement and the meaning of terms: phase, component and the degree of freedom
2		Thermodynamic derivation of the Gibbs phase rule
3		One component system: water system, CO <sub>2</sub> system
4		Sulphur system
5		Two component system: solid liquid equilibrium, simple eutectic system: Bi-Cd system
6		Pb-Ag system and desilverisation of lead
		<b>Solid solution</b>
7		Type B system: Zn-Mg system
8		NaCl-H <sub>2</sub> O system, copper sulphate water system
		<b>Liquid liquid mixture</b>
9		Raoult's law and Henry's law
10		Ideal and non-ideal solutions
11		Azeotropes: HCl-H <sub>2</sub> O and ethanol water system
		<b>Partial miscible liquids</b>
12		Phenol-water, trimethylamine-water and nicotine-water system
13		Lower and upper consolute temperature, steam distillation
14		Nernst distribution law: thermodynamic derivation, application.
	2	<b>Electrochemistry-I</b>
15		Electrical transport, conduction in metal and electrolyte solutions
16		Resistance, conductance, Specific and equivalent conductivity
17		Measurement of equivalent conductance, effect of dilution on conductivity
18		Migration of ions and Kohlrausch law and application
19		Arrhenius theory of electrolyte dissociation and its limitations
20		Weak and strong electrolytes, Ostwald's dilution law
21		Debye Huckel theory and DHO equation
22		Transport number, Hittorf method
23		Moving boundary method
24		Types of reversible electrodes: Gas metal ion, metal-metal ion, metal- insoluble salt anion and redox electrode
25		electrode reactions, Nernst equation
26		derivation of cell EMF and single electrode potential
27		Standard hydrogen electrode, standard electrode potential
28		EMF of cell and its measurements, computation of cell EMF
29		calculation of thermodynamic quantities of cell reaction (ΔG, ΔH, K)
30		solubility product and activity coefficient
31		potentiometric and conductometric titration
32		definition of pH and pK, determination of pH using hydrogen, quinhydrone and glass electrode by
33		potentiometric methods
	3	<b>Aldehydes and Ketones</b>
34		Nomenclature, structure of the carbonyl group
35		synthesis of aldehydes and ketones - synthesis of aldehyde from acid chlorides
36		synthesis of aldehyde and ketone from 1,3 dithianes
37		synthesis of ketones from nitriles and carboxylic acids
38		physical properties
39		mechanism of reactions- Aldol condensation and benzoin condensation
40		Perkin reaction and Knoevenagel condensations

41		condensation with ammonia and its derivatives
42		Wittig reaction and Mannich reaction
43		Use of acetals as protecting groups, oxidation of aldehydes
44		Baeyer-Villiger oxidation of ketones, Cannizzaro reaction
45		MPV, Clemmensen, Wolf-Kishner reaction
46		$\text{LiAlH}_4$ and $\text{NaBH}_4$ reduction, Halogenation
		<b>Carboxylic acids</b>
47		Nomenclature, structure and bonding
48		physical properties and acidity of carboxylic acids
49		effect of substituents on acid strength
50		Preparation and reactions of carboxylic acids
51		HVZ reaction, synthesis of acid chloride, esters and amides
52		reduction of carboxylic acids, Mechanism of decarboxylation
	4	<b>Carboxylic acids derivatives:</b>
53		structure and nomenclature of acid chlorides, esters, amides and acid anhydrides
54		physical properties
55		interconversion of acid derivative by nucleophilic acyl substitution
56		preparation of carboxylic acid derivatives, chemical reactions
57		Mechanism of esterification and hydrolysis
58		Co-ordination Chemistry: MOT diagram for tetrahedral, square planar complex
59		MOT diagram for Octahedral complexes
60		Green Chemistry: principle, 12 tenets
61		description with examples
	5	<b>(a) Chemistry of Lanthanide elements</b>
62		electronic structure, oxidation states
63		ionic radii and lanthanide contraction
64		complex formation occurrence and isolation
65		lanthanide compounds
		<b>(b) Chemistry of Actinides</b>
66		General features and chemistry of actinides
67		chemistry of Np, Pu and Am from U, Similarities between lanthanides and actinides

**Maharaja Ranjit Singh College of Professional Sciences, Indore**

Department of Chemical Sciences

Lesson Plan - B.Sc. IV Sem (Jan 2018 - June 2018)

Subject - Chemistry Practical

**Teacher - Prof. Seema Shintre**

Day/Lecture	Unit	Topic
		<b>Organic Chemistry: Qualitative analysis</b>
1		Identification of an organic compound through the functional group analysis, determination of melting point and preparation of suitable derivatives.
		<b>Physical Chemistry</b>
2	a	Determination of transition temperature of given substance by thermometric, dilatometric method.
	b	Phase equilibrium:
3	1	To study the effect of solute on the critical solution temperature of two partially miscible liquid.
4	2	To construct the phase diagram of two component by cooling curve method.
	c	Thermochemistry
5	1	To determine the enthalpy of neutralization of weak acid/weak base versus strong acid/ strong base and determine the enthalpy of ionization of the weak acid/base.
		<b>Inorganic Chemistry: Quantitative volumetric analysis</b>
6	1	Estimation of ferrous and ferric by dichromate method.
7	2	Estimation of copper using thiosulphate.

**Maharaja Ranjit Singh College of Professional Sciences, Indore**

Department of Chemical Science

Lesson Plan - B.Sc. V Sem Chemistry (July 2017 - Dec 2017)

Subject - Chemistry

Teacher - Dr. Lal Kumar

Day/Lecture	Unit	Topic
1	I	<b>Organic Compounds of Nitrogen:</b>
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	<b>A. Carbohydrates-I</b>
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>B. Carbohydrates-II</b>

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	<b>III</b>	<b>A. Photochemistry</b>
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>B. UV Spectroscopy</b>
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	<b>IV</b>	<b>A. Bioinorganic Chemistry-I</b>
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 Ca <sup>2+</sup> .
47	IV	<b>B. Bioinorganic Chemistry-II</b>
48	IV	Role of metal ions in biological process, nitrogen fixation
49	IV	oxygen uptake proteins, cytochromes and ferredoxins.
50	<b>V</b>	<b>A. Hard and Soft Acids and Bases(HSAB)</b>
51	V	Classification of acids and bases as hard and soft
52	V	Pearson's HSAB Concept, Symbiosis
53	V	<b>B. Analytical Chemistry</b>
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	<b>C. Inorganic Polymer</b>
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 2017 - Dec 2017)

Subject - Chemistry Practical

**Teacher - Dr. Lal Kumar**

<b>Day/Lecture</b>	<b>Unit</b>	<b>Topic</b>
1	I	<b>Inorganic Chemistry</b>
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	<b>Gravimetric Analysis</b>
6	I	To estimate barium as a barium sulphate
7	II	<b>Organic Chemistry Preparation</b>
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 2018 - June 2018)

Subject - Chemistry

**Teacher - Dr. Lal Kumar**

Day/Lecture	Unit	Topic
1	I	<b>A. Amino Acids</b>
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>B. Nucleic acids:</b> Introduction of nucleic acids and constituents of nucleic acid,
9	I	Ribonucleosides, Ribonucleotides,
10	I	Double helical structure of DNA
11	I	<b>C. Elementary idea of Fats, Oils &amp; Detergents:</b>
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	<b>A. Organometallic Chemistry:</b>
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>B. Organometallic Compounds:</b>
20	II	Organomagnesium Compound -
21	II	Grignard Reagent and Organolithium Compounds,
22	II	Methods of preparation, structure and synthetic applications.
23	III	<b>Magnetic properties of transition metal complexes:</b>
24	III	Magnetic moment
25	III	(spin only and with L-S coupling),
26	III	orbital contribution magnetic moment.
27	III	<b>B. Electronic spectra of transition metal complexes:</b>
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	<b>C. Water Analysis:</b>
33	III	Hardness, types of hardness,
34	III	Acidity and alkalinity, BOD, COD and DO.
35	IV	<b>A. Infrared spectroscopy :</b>
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>B. Energy levels of simple harmonic oscillator,</b>
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	<b>C. Raman Spectroscopy:</b>
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	<b>A. NMR Spectroscopy</b>
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>B. Surface Phenomena and Catalysis:</b>
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 2018 - June 2018)

Subject - Chemistry Practical

**Teacher - Dr. Lal Kumar**

Day/Lecture	Unit	Topic
1	<b>I</b>	<b>Organic Chemistry</b>
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	<b>II</b>	<b>Physical Instrumentation</b>
7	II	A. Job's Method
8	II	B. Mole-ratio method
9	<b>III</b>	<b>Inorganic Chemistry</b>
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.