Maharaja Ranjit Singh College of Professional Sciences, Indore

Department of Chemical Sciences

Lesson Plan - M. Sc. III (July 2020 -Dec 2020)

Subject - Photochemistry

Teacher - Dr. Dipak Sharma

Day/Lecture	Unit	Topic
1	1	Photochemical Reactions
2	1	Interaction of electromagnetic radiation with matter
3	1	Interaction of electromagnetic radiation with matter
4	1	Types of excitations
5	1	Fate of excited molecule
6	1	Fate of excited molecule
7	1	Fate of excited molecule
8	1	Quantum yield
9	1	Quantum yield
10	1	Transfer of excitation energy
11	1	Actinometry
12	1	Actinometry
13	2	Determination of reaction mechanism
14	2	Classification
15	2	Rate constants
16	2	Life times of reactive energy state
17	2	Life times of reactive energy state
18	2	Determination of rate constants of reactions
19	2	Determination of rate constants of reactions
20	2	Effect of light intensity on the rate of photochemical reactions
21	2	Effect of light intensity on the rate of photochemical reactions
22	2	Types of photochemical reactions-
23	2	Photo dissociation
24	2	Gas-phase photolysis
25	3	Photochemistry of Alkenes
26	3	Intramolecular reactions of the olefinic bond
27	3	Geometrical isomerism
28	3	Cyclisation reactions
29	3	Rearrangement of 1,4 and 1,5-dienes
30	3	Rearrangement of 1,4 and 1,5-dienes
31	3	Phtochemistry of aromatic compounds
32	3	Isomerisations
33	3	Isomerisations
34	3	Additions
35	3	Additions
36	3	Substitutions

37	4	Photochemistry of Carbonyl Compounds
38	4	Intramolecular reactions of carbonyl compounds
39	4	Intramolecular reactions of carbonyl compounds
40	4	Saturated compounds
41	4	Cyclic compounds
42	4	Acyclic compounds
43	4	Beta, Gama unsaturated compounds
44	4	Alpha, Beta unsaturated compounds
45	4	Cyclohexadienones
46	4	Intermolecular cyloaddition reactions
47	4	Dimerisations
48	4	Oxetane formation
49	5	Miscellaneous photochemical reactions
50	5	Photo-Fries reactions of annilides
51	5	Photo-Fries reactions of annilides
52	5	Photo-Fries rearrangement
53	5	Barton reaction
54	5	Singlet molecular oxygen and its reactions
55	5	Singlet molecular oxygen and its reactions
56	5	Photochemical formation of smog
57	5	Photodegradation of polymers
58	5	Photodegradation of polymers
59	5	Photochemistry of vision
60	5	Photochemistry of vision

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Department of Chemical Sciences

Lesson Plan - M. Sc. III Sem. (July 2020 -Dec 2020)

Subject - **Polymer**

Teacher - Dr. Lal Kumar

Day/Lecture	Unit	Topic
1	**I**	**Basics**
2	I	Importance of polymers
3	I	Basic concepts: monomer, repeating units degree of polymerisations
4	I	Basic ideas about Linear, Branched and network polymers
5	I	Classification of polymers
6	I	Polymerisation process
7	I	condensation, addition, radical, chain - ionic and
8	I	coordination and copolymerisation
9	I	Poymerisation conditions and polymer reactions
10	I	Polymerisation in homogeneous and heterogeneous systems
11	**II**	**Polymer Characterisation**
12	II	Polydispersion-average molecular weight concept
13	II	Number Average molecular weight concept
14	II	Weight Average molecular weight concept
15	II	Viscosity Average molecular weight concept
16	II	Polydispersity and molecular weight distribution
17	II	The practical significance of molecular weight
18	II	Measurement of molecular weights
19	II	End group analysis
20	II	Viscosity
21	II	Light scattering and osmotic
22	II	Ultracentrifugation methods
23	**III**	**Anaysis and testing of Polymers**
24	III	Chemical Analysis of Polymers
25	III	Spectroscopic Methods
26	III	X-ray Diffraction study
27	III	Microscopy
28	III	Thermal Analysis and physical testing
29	III	Tesile strength
30	III	Fatigue
31	III	Impact
32	III	Tear resistance, Hardness and Abrasion resistance

33	**IV**	**Inorganic Polymers**
34	IV	A General survey and scope of inorganic polymers
35	IV	special characteristics
36	IV	Classification of Homo and Hetero atomic polymers
37	IV	Structure, Properties and Application of
38	IV	Polymer based on boron borazines
39	IV	boranes and carboranes
40	IV	Polymers based on Silicon silicones
41	IV	polymetalloxanes and polymetallosiloxanes
42	IV	Silazanes
43	**V**	**Structure, Properties and Application of Polymers**
44	V	Polymers based on phosphorous-phosphazenes
45	V	Polyphosphates
46	V	Polymer based on Sulphur tetrasulphur
47	V	Tetranitride and related compounds
48	V	coordination and metal chelate polymers

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Department of Chemical Sciences

Lesson Plan - M. Sc. III Sem. (July 2020 -Dec 2020)

Subject - Organotransition Metal Chemistry

Teacher - Prof. Deepanshu Pandey

Day/Lecture	Unit	Topic
1	Unit 1	**Alkyls and Aryls of Transition Metals:** Introduction
2	Unit 1	Types & routes of synthesis
3	Unit 1	stability & decomposition pathways
4	Unit 1	Organocopper in organic synthesis
5	Unit 1	**Compounds of Transition Metal- Carbon Multiple Bonds**
6	Unit 1	Alkylidenes, alkylidynes
7	Unit 1	Low valent carbenes & carbynes : Synthesis
8	Unit 1	Low valent carbenes & carbynes : Synthesis
9	Unit 1	Carbenes & Carbynes : nature of bond
10	Unit 1	Carbenes & Carbynes : structural characteristic
11	Unit 1	electrophilc & Nucleophilic attack on ligands
12	Unit 1	Revision after completion of chapter
13	Unit 2	**Transition Metal π- Complexes :**
14	Unit 2	Tansititon metal π complexes with unsaturated organic molecules
15	Unit 2	Alkenes:Preperation, Properties , Nature of bonding & structural feature
16	Unit 2	Alkynes: Preperation, Properties , Nature of bonding & structural feature
17	Unit 2	allyl : Preperation, Properties , Nature of bonding & structural feature
18	Unit 2	diene : Preperation, Properties , Nature of bonding & structural feature
19	Unit 2	arene : Preperation, Properties , Nature of bonding & structural feature
20	Unit 2	trienyl : Preperation, Properties , Nature of bonding & structural feature
21	Unit 2	Important reaction reactions related to nucleophilic attack on ligands
22	Unit 2	Important reaaction reactions related to electrophilic attacks on ligands
23	Unit 2	Nucleophilic & electrophilic reaction in organic synthesis
24	Unit 2	Revision after completion of chapter

25	Unit 3	**Transition organometallic compounds:**
26	Unit 3	Transition metal compounds with bond to hydrogen
27	Unit 3	Transition metal compounds with bond to hydrogen
28	Unit 3	Transition metal compounds with bonds to boron
29	Unit 3	Transition metal compounds with bonds to boron
30	Unit 3	Transition metal compounds with bonds to silicon
31	Unit 3	Transition metal compounds with bonds to silicon
32	Unit 4	**Homogeneous Catalysis :** Stoichiometric reaction for catalysis
33	Unit 4	Homogeneous catalytic hydrogenation
34	Unit 4	Zeigler-Natta polymerization of olefins (oxoreaction)
35	Unit 4	Explanation reaction
36	Unit 4	activation of C-H bond
37	Unit 4	Revision after completion of unit
38	Unit 5	**Fluxional Organometallic Compounds :**
39	Unit 5	Fluxionality and dynamic equlibrium in compounds such as η2 olefins
40	Unit 5	Fluxionality and dynamic equlibrium in compounds such as η3 allyl
41	Unit 5	Fluxionality and dynamic equlibrium in compounds such as dienyl complexes
42	Unit 5	Fluxionality and dynamic equlibrium in compounds such as dienyl complexes
43	Unit 5	Fluxionality and dynamic equlibrium in compounds such as η2 olefins
44	Unit 5	Revision after completion of unit

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Department of Chemical Sciences

Lesson Plan - M. Sc. III Sem. (July 2020 -Dec 2020)

Subject - Application of Spectroscopy-I

Teacher - Prof. Seema Shintre

Day/Lecture	Unit	Topic
	1	**Electronic Spectroscopy**
1		Electronic spectral studies for d1 to d9 system in octahedral complex via orgel diagram
2		Electronic spectral studies for d1 to d9 system in tetrahedral complex via orgel diagram
3		Electronic spectral studies for d1 to d9 system in square planner complex via orgel diagram
4		Tanabe Sugano diagram
	2	**Vibrational Spectroscopy**
5		Inroduction part of vibrational and raman spectroscopy
6		Symmetry and shape of AB, AB2,AB3,AB4.AB5 and AB6 molecule
7		Mode of bonding of ambidentate ligands(nitrosyl and thiocyanate)
8		Mode of bonding of bidentate ligands(ethylenediamine and diketoneto complexes)
9		RRS and Application of resonance Raman spectroscopy
	3	**Nuclear magnetic resonance spectroscopy-I**
10		General introduction and defination
11		Chemical Shift and spin spin interaction
12		Shielding and deshielding mechanism
13		measurmrnt of chemical shift values
14		Correlation for protons bonded to carbon (aliphatic, olefinic, aldehydic and aromatic)
15		Correlation for protons bonded to carbon (alcohols, phenols, enols)
16		Correlation for protons bonded to carbon (carboxilic acids,amines,amides & mercapto)
	4	**Nuclear magnetic resonance spectroscopy-II**
17		Chemical exchange and effect of deuteration
18		Complex spin spin interaction between 2,3,4 and 5 nuclei stereochemistry
19		Hindered rotation
20		Karplus curve variation of coupling constant with disordered angle
21		NMR shift reagents
22		solvent effect
23		Nuclear Overhauser Effect (NOE)
	5	**Mossbauer Spectroscopy**
24		Basic principle of mossbauer spectroscopy
25		Spectral parameters : chemical shift
26		Quadrupole interaction
27		Magnetic interaction
28		Application of mossbauer spectroscopy

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Department of Chemical Sciences

Lesson Plan - M.Sc. III Sem Chemistry (July 2020- Dec - 2020)

Subject - Environmental Chemistry

Teacher - Dr. Mukesh Gupta

Day/Lecture	Unit	Topic
1	Unit 1	Atmosphere- atmospheric layers
2		vertical temperature profile
3		Heat/ radiation budget of the earth
4		Atmosphere system
5		Properties of inosphere
6		Thermodynamic derivation of lapes rate
7		Temperature inversion
8		Calculation of global mean temperature of the atmosphere
9		Pressure variation in atmosphere and scale height
10		Biochemical cycle of Carbon
11		Biochemical cycle of nitrogen
12		Biochemical cycle of sulphur
13		Biochemical cycle of phosphorus
14		Biochemical cycle of Oxygen
15		Residence times
16		Atmospheric chemistry, sources of trace atmospheric constituents
17		Sources of trace atmospheric constituents nitrogen oxide
18		Sources of trace atmospheric constituents sulphurdioxide and other sulphur compounds
19		Sources of trace atmospheric constituents carbon oxides
20		Sources of trace atmospheric constituents chlorofluoro carbon and other halogen compound
21		Tropospheric photochemistry
22		Mechanism of photochemical decomposition of NO and formation of ozone
23		Formation of Oxygen atoms, hydroxyl, hydropropoxy,organic radical and hydrogen peroxide
24		Reaction of hydroxyl radical with SO2 and NO
25		Formation of nitrate radical and its reaction
26		Photochemical smog meteorological condition and chemistry of its formation
27	Unit 2	Air pollotion and there classification
28		Aerosols -sources, size and distribution and effects on visibility,Climate and health
29		Aerosols -sources, size and distribution and effects on visibility,Climate and health
30		Acid rain defition,formation of acid rain, effects of acid rain , reaction of acid rain
31		Acid rain defition,formation of acid rain, effects of acid rain , reaction of acid rain
32		Stratospheric ozone depletion
33		Mechanism of ozone formation
34		Mechanism of catalytic ozone depletion
35		Discovery of Antarctic ozone hole and role of chemistry and meteorology
36		Control strategies
37		Green House effect, terrestrial and solar radiation spectra
38		Major green house gasesand their sourcesand Global warming potentials
39		Climate change and conscquences
40		Urban Air pollution , Exhaust emission,damazing effect, monitoring of CO
41		Control strategies

42	Unit 3	Aquatic chemistry and water pollution,redox chemistry in natural water
43		Dissolve oxygen, determination of dissolve oxygen(DO)
44		Biochemical oxygen demand, determination of biological oxygen demand(BOD)
45		Chemical oxygen demand, determination of chemical oxygen demand (COD)
46		Aerobic and anaerobic reaction of organic sulphur and nitrogen compound in water
47		Acid-base chemistry of freshwater and sea water
48		Aluminium nitrate and fluorides in water, petrification
49		Sourcesof water pollution, treatment of waste and sewage water
50		Purification of drinking water, techniquesof purification and disinfection
51	Unit 4	Environmental toxicology, toxic heavy metals
52		Toxic heavy metals mercury
53		Toxic heavy metals lead, Arsenic
54		Toxic heavy metals Cadmium
55		Causes of toxicity
56		Bioaccumulation
57		Sources of heavy metals
58		Chemical speciation of Hg
59		Chemical speciation of Pb
60		Chemical speciation of As
61		Chemical speciation of Cd
62		Biochemical and damaging effect
63		Toxic organic compound, pesticides
64		Classification of pesticides
65		Properties and uses of organoChlorine and ionospheres pesticide
66		detection and damaging effects of organoChlorine and ionospheres pesticide
67		Polychlorinated biphenyls- properties,uses and environmental continuation and effects
68		Polynuclear aromatic hydrocarbons-sources, structures and as pollutants
69	Unit 5	Soil and environmental disasters, Soil composition
70		Micro and macro nutrients
71		Soil pollution by fertilizers,plastic and metals
72		Methods of re-mediation of Soil
73		Bhopal gas tragrdy
74		Chemobyl disaster
75		Three mile island disaster
76		Minimata disease
77		Sevoso (Italy) disaster
78		London Smog

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Department of Chemical Sciences

Lesson Plan - M. Sc. III Sem. (July 2020 -Dec 2020)

Subject - Inorganic Chemistry Practical

Teacher - Prof. Seema Shintre

Day/Lecture	Unit	Topic
		Quantitative determination of 3 component mixture: 1 volumetrically & 2 gravimatrically
1	a	Cu2+, Ni2+, Zn2+
2		Cu2+, Ni2+, Zn2+
3	b	Ag+, Ni2+, Mg2+
4		Ag+, Ni2+, Mg2+
		Chromatographic seperations and determination of Rf values:
5		Paper chromatography: Group II metal ions
6		Paper chromatography: Cu2+, Fe2+, Ni2+ & Co2+
7		Thin layer chromatography: Ink pigment(black)
8		Thin layer chromatography: Ink pigment(blue and Red)
9		Column chromatography: indicators

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Department of Chemical Sciences

Lesson Plan - M. Sc. III Sem. (July 2020 -Dec 2020)

Subject - Organic Chemistry Practical

Teacher - Dr. Lal Kumar

Day/Lecture	Unit	Topic
1	**I**	**Multi Step Synthesis**
2	I	To prepare and submit p-nitroaniline from aniline
3	I	To prepare and submit p-bromoaniline from aniline
4	I	To prepare and submit Anthranilic acid from phthalic acid
5	I	To prepare and submit benzopincolone from benzophenone
6	I	To prepare and submit Bezoin from bezilic acid
7	I	To prepare and submit Benzidine from hydrazobenzene
8	**II**	**Quantitative Estimation (Titrimetric Method)**
9	II	To estimate glucose by Titrimetric Method
10	II	To estimate glycine by Titrimetric Method
11	II	To estimate Vitamin C tablet by Titrimetric Method
12	II	To determine DO from the given sample
13	II	To determine COD from the given sample
14	II	To determine BOD from the given sample

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Department of Chemical Sciences

Lesson Plan - M. Sc. III Sem. (Jul 2020 - Dec 2020)

Subject - Physical Chemistry III

Teacher - Prof. Deepanshu Pandey

Day/Lecture	Unit	Topic
1	Sec A	**Spectroscopy :**
2	Sec A	Interpretation of IR,NMR spectra
3	Sec A	Numerical problems on UV,IR & NMR
4	Sec A	**Spectrophotometry/Calorimetry :**
5	Sec A	Determination of the composition of a mixture of K2Cr2O7 & KMnO4 (mixture law)
6	Sec A	Determination of phosphate concentration in soft drink
7	Sec A	Titration of Mohr's salt with K2Cr2O7 / KMnO4 solution
8	Sec A	Determination of order & energy of activation for the decomposition of violet colour complex formed between complex formed.
9	Sec A	**Chemical Kinetics:**
10	Sec A	Determination of kinetics of decomposition of complex formed between sodium sulphide & sodium nitroprusside spectrophotometrically.
11	Sec A	Investigate the reaction between acetone & iodine.
12	Sec B	**Electronics :**
13	Sec B	Study the charge & discharge of a capacitor through a resistor.
14	Sec B	Verification of Kirchoff's current law & Kirchoff's voltage law
15	Sec B	**Conductometry :**
16	Sec B	Determination of equilivalent conductance of a weak electrolyte at different concentration and hence the dissociation constant of the electrolyte.
17	Sec B	Determination of equivalent conductance of a weak electrolyte at infinite dilution using Kohlrausch law.
18	Sec B	**pH metry :**
19	Sec B	Determination of acidic and basic dissociation constant of an amino acid and isoelectric point of the acid.
20	Sec B	Measurement of the pH of buffer solution (CH3COOH + CH3COONa) using Henderson's equation & hence Pka.

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Department of Chemical Sciences

Lesson Plan - M. Sc. IV Sem. (Jan 2020 - Jun 2020)

Subject - Application of Spectroscopy - II

Teacher - Prof. Deepanshu Pandey

Day/Lecture	Unit	Topic
1	Unit -1	**Ultraviolet and Visible spectroscopy :**
2	Unit -1	various electronic transition (185 - 800 nm)
3	Unit -1	Beer-lambert law, Effect of solvent on electronic transition
4	Unit -1	ultraviolet bands for carbonyl compounds
5	Unit -1	ultravilet bands for unsaturated carbonyl compounds
6	Unit -1	ultravilet bands for dienes
7	Unit -1	ultravilet bands for conjugated polyenes,
8	Unit -1	Fisher- Woodward rule for conjugated dienes
9	Unit -1	Fisher- Woodward rule carbonyls compounds
10	Unit -1	ultraviolet spectra of aromatic compounds
11	Unit -1	Steric effect in biphenyls
12	Unit -1	Revision after the completion of unit
13	Unit -2	**Infrared Spectroscopy :**
14	Unit -2	Characteristic vibrational frequencies of alkanes
15	Unit -2	Characteristic vibrational frequencies of alkenes, alkynes
16	Unit -2	Characteristic vibrational frequencies of aromatic compounds, alcohol
17	Unit -2	Characteristic vibrational frequencies of ethers, amides
18	Unit -2	Characteristic vibrational frequencies of acid anhydrides
19	Unit -2	Characteristic vibrational frequencies of lactones, lactams
20	Unit -2	Characteristic vibrational frequencies of conjugated carbonyl
21	Unit -2	effect of hydrogen bonding and solvent effect on vibrational frequencies
22	Unit -2	overtones, combination bands and fermi resonance
23	Unit -2	Revision after the completion of unit
24	Unit- 3	**Nuclear Magnetic Resonance Of Paramagnetic Substances in Solution :**
25	Unit- 3	The contact and Pseudo contact shifts
26	Unit- 3	Factor affecting nuclear relaxation
27	Unit- 3	some applications including biochemical systems
28	Unit- 3	some applications including biochemical systems
29	Unit- 3	an overview of NMR of metal nuclides with emphasis on 195 Pt and 119 Sn NMR
30	Unit- 3	Revision after the completion of unit

31	Unit- 4	**Carbon- 13 NMR Spectroscopy :**
32	Unit- 4	General Considerations, Chemical Shift (aliphatic olefinic)
33	Unit- 4	Chemical Shift (alkyne , aromatic heteroaromatic and carbonyl compounds)
34	Unit- 4	Coupling constants
35	Unit- 4	Two dimension NMR spectroscopy ,COSY , NOESY
36	Unit- 4	Two dimension NMR spectroscopy ,COSY , NOESY
37	Unit- 4	DEPT, HMBC & HMQC technique
38	Unit- 4	DEPT, HMBC & HMQC technique
39	Unit- 4	DEPT, HMBC & HMQC technique
40	Unit- 4	Revision after the completion of unit
41	Unit - 5	**Mass Spectroscopy :**
42	Unit - 5	Introduction ion production E1, C1
43	Unit - 5	FD,ESI & FAB
44	Unit - 5	Factors affecting fragmentation
45	Unit - 5	ion analysis , ion abundance mass spectral
46	Unit - 5	Fragmentation of organic compounds common functional group
47	Unit - 5	molecular ion peak
48	Unit - 5	metastable peak, mclafferty rearrangement
49	Unit - 5	Nitrogen rule, High resolution mass spectrometry
50	Unit - 5	Example of mass spectral fragmentation of organic compounds with respect to their structure determination
51	Unit - 5	Example of mass spectral fragmentation of organic compounds with respect to their structure determination
52	Unit - 5	Revision after the completion of unit

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Department of Chemical Sciences

Lesson Plan - M. Sc. IV (Jan 2020 - Jun 2020)

Subject - Analytical Chemistry

Teacher - Dr. Dipak Sharma

Day/Lecture	Unit	Topic
1	1	Introduction: Role of analytical chemistry, Classification of analytical methods, classical and instrumental
2		Types of instrumental analysis, Selecting an analytical method, Neatness and cleanliness
3		Laboratory operations and practices, Analytical balance, techniques of weighing, errors
4		Volumetric glassware cleaning and calibration of glassware
5		Sample preparation-dissolution and decompositions
6		Gravimetric techniques, selecting and handling of reagents.
7		Laboratory notebooks. Safety in the analytical laboratory, Errors and Evaluation: Definition of terms in mean and median.
8		Precision-standard deviation, Relative standared deviation.
9		Accuracy-absolute error, relative error. Types of error in experimental data determinate (systematic), indeterminate (random) and gross
10		Sources of error and the effects upon the analytical results.
11		Methodes of reporting analytical data
12		Statistical evaluation of data-indeterminate errors. The uses of statisti
13	2	Food Analysis: Moisture, ash
14		Crude protein,
15		Fat crude fiber, carbohydrates,
16		Calcium, potassium,
17		Sodium, phosphate
18		Food adulteration-common adulteration in food, contamination in food stuff
19		Microscopic examination of foods for adulterants
20		Pesticide analysis in food prodcuts
21		Extraction and purification of sampale
22		HPLC
23		Gas chromatography for organophosphates
24		Thin layer chromatography for identification of chlorinated pesticides in food products
25	3	Analysis of water pollution
26		Origine of waste water, types, water pollutants and their effects
27		Sourecs of water pollution-domestic, industrial, agricultural, soil and radioactive wastes as sources of pollution
28		Objectives of analysis-parameter for analysis-colour, turbidity
29		Total solids, conductivity, acidity
30		Alakalinity, hardness
31		Chloride, sulphate, fluoride
32		Silica, phosphates and dirrerent forms of nitrogen
33		Heavy metal pollution-public health significance of Cd, Cu, Pb, Zn, Mg, Hg, arsenic
34		General survey of instrumental technique for the analysis of heavy metals in aqueous system
35		Measurements of DO, BOD, COD

36		Pesticides as water pollutants and analysis. Water pollution laws and standards

37	4	Analysis of soil, fuel, body fluids and drugs
38		Analysis of soil, moisture, pH
39		Total nitrogen, phosphorus
40		Silica, lime
41		Magnesia, manganese
42		Sulphur, alkali salts
43		Fuel analysis: liguid and gas
44		Ultimate and proximate analysis
45		heating values, grading of coal
46		Liquide fuels-flash point, aniline point
47		Octane number, carbon residue
48		Gaseous fuels, produced gas and water gas, calorific value
49	5	Clinical chemistry: Composition of blood, collection and preservation of samples
50		Clinical analysis. Serum electrolytes, blood glucose
51		Blood urea nitrogen, uric acid
52		Albumin, globulins, barbiturates
53		Acid and alkaline phosphates
54		Immunoassay: principles of radio immunoassay and applications
55		The blood gas analysis trace elements
56		Drug analysis
57		Narcotics and dangerous drug
58		Calassification of drugs
59		Screening by gas and thin layer chromatography
60		Spectrophotometric measurements

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Department of Chemical Sciences

Lesson Plan - M. Sc. IV Sem. (Jan 2020 - Jun 2020)

Subject - Biochemistry

Teacher - Prof. Seema Shintre

Day/Lecture	Unit	Topic
	1	**Metal ions in biological system**
1		Bulk and trace metals with special referance to Na, K, Mg
2		Bulk and trace metals with special referance to Ca, Fe, Cu,Zn
3		K+/Na+ pump
		Bioenergetics and ATP Cycles
4		DNA polymerisation
5		Glucose storage
6		Metal complexes in transmission of energy; chlorophyll's
7		Photosystem I and Photosystem II in cleavage of water
		Transport and storage of dioxygen
8		Heam proteins and oxygen uptake structure and function of Heamoglobin's
9		Myoglobin, Heamocyanms and Hemerythrin
10		Model synthetic complexes of iron, cobalt and copper
	2	**Electron transfer in biology**
11		Structure and function of metal of proteins in electron transport process
12		cytochrome's and iron-sulphur proteins
13		Synthetic models
		Nitrogen Fixation
14		Biological nitrogen fixation and its mechanism
15		nitrogenase, chemical nitrogen fixation
	3	**Enzymes**
16		Introduction and historical perspective, chemical and biological catalysis
17		Remarkable properties of enzmes like catalytic power,specificity and regulation
18		Nomenclature and classification
19		Extraction and purification
20		Fischer's lock and key model and Koshaland's induced fit hypothesis
21		concept and identification by site directed mutagenesis
22		Enzyme kinetics, Michael's-Menten equation and lineweaver burk plots
23		Reversible and irreversible inhibition
		Mechanism of enzyme action
24		Transition state theory
25		Orientation and Steric effect
26		Acid-base catalysis, covalent catalysis
27		Strain or distortion
28		Enzyme mechanisms for chemotrypsin, Ribonuclease
29		Enzyme mechanisms for lysozyme and carboxypeptidase
		Kinds of reactions catalysed by enzymes
30		Nucleophilic displacement on a phosphorus atom, multiple displacement reactions
31		Couplingof ATP cleavage to endergonic processes
32		Transfer of sulphate, addition and elimination reactions
33		Enolic intermediates in isomerisations reactions
34		b-cleavage and codensation
35		some isomerization and rearrangement reactions
36		Enzyme catalyzed carboxylation and decarboxylation
	4	**Co- enzyme chemistry**

37		Cofactors as derived from vitamines,coenzyme,prosthetic groups, apoenzymes
38		structure and biological functions of coenzymes A, thiamine pyrophosphate
39		pyridoxal phosphate, NAD+,NADP+, FMN, FAD
40		Lipoic acid and vitamin B12
41		Mechanism of reactions catalyzed by the above cofactors
		Enzyme models
42		Host -guest chemistry, chiral recognition and catalysis
43		molecular recognition, molecular asymmetry and prochirality biometric chemistry
44		crown ether, cryptates, cyclodextrins and its enzyme models
45		Clixarenes, Ionospheres, Micelles synthetic enzymes
		Biotechnological applications of enzymes
46		large scale productionand purification of enzymes
47		Immobilization of enzymes
48		Effect of immobilization on enzyme activity and application of immobilized enzymes
49		Use of enzymes as targets for drug design
50		Clinical uses of enzymes, enzyme therapy , recombinant DNA technology
	5	**Biological cell and its constituents**
51		Biological cells, structure and function of protein, enzymes
52		DNA and RNA in living systems
53		Helix coils transition
		Bioenergetics
54		Standard free energy change in biochemical reactions,exergonic and endergonic
55		Hydrolysis of ATP, synthesis of ATP from ADP
		Biopolymer interactions
56		Forces involved in biopolymer interactions, electrostatic charges and molecular expansion
57		hydrophobic forces, dispersion force interactions
58		Multiple equilibrium and various types of binding processes in biological systems
59		Hydrogen ion titration curves.
		Cell membrane and transport of ions
60		Structure and function of cell membrane
61		ion transport through cell membrane
62		irreversible thermodynamic treatment of membrane transport
63		Nerve conduction

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Department of Chemical Sciences

Lesson Plan - **M. Sc. IV Sem.** (**Jan 2021 - June 2021**)

Subject - **Solid State Chemistry**

Teacher - **Dr. Lal Kumar**

Day/Lecture	Unit	Topic
1	**I**	**Solid State Reactions**
2	I	General Principle
3	I	Experimental Procedure
4	I	Coprecipitation as a precursor to solid state reactions
5	I	Kinetics of solid state reactions
6	**II**	**Crystal Defects and Non-Stoichiometry**
7	II	Perfect and imperfect crystals
8	II	Interinsic and extrinsic defectrs
9	II	Point Defects
10	II	Line Defects and plane defects
11	II	Vacancies Schottky Defects and Frenkel Defects
12	II	Thermodynamics of Schottky and Frenkel Defect formation
13	II	Colour centres
14	II	non-stoichiometry and defects
15	**III**	**Electronic Properties and Band Theory**
16	III	Metal Insulators and semiconductors
17	III	Electronic structure of solids band theory
18	III	Band structure of metals insulators and semiconductors
19	III	Interinsic and extrinsic semiconductors
20	III	Dopping semiconductors
21	III	p-n-junctions
22	III	Supperconductors
23	III	Optical Properties
24	III	Application of optical and electron microscopy
25	III	Magnetic properties
26	III	Classification of materials, effect of temparature
27	III	Calculation of magnetic moment
28	III	mechanism of ferro and antiferromagnetic
29	III	odering super exchange
30	**IV**	**Organic Solids**
31	IV	Eelectrically conducting solid
32	IV	organic charge transfer complex
33	IV	organic metals
34	IV	New superconductors
35	**V**	**Liquid Crystals**
36	V	Type of Liquid crystals
37	V	Nematic, Smectic
38	V	Ferroelectric
39	V	Antiferroelectric
40	V	Various theories of liquid crystals
41	V	Liquid crystals display (LCD)
42	V	New Materials

Maharaja Ranjit Singh College of Professional Sciences, Indore
Department of Chemical Science
Lesson Plan - **M.Sc. III Sem Chemistry (Jan 2021 - June 2021)**
Subject - **Medicinal Chemistry**
Teacher - **Dr. Mukesh Gupta**

Day/Lecture	Unit	Topic
1	Unit 1	Structure and activity- relationship between chemical strycture and biological activity (SAR)
2	Unit 1	Structure and activity- relationship between chemical strycture and biological activity (SAR)
3	Unit 1	Receptor site theory
4	Unit 1	Approaches to drug design
5	Unit 1	Approaches to drug design
6	Unit 1	Introduction to combinatorial synthesis in drug design
7	Unit 1	Introduction to combinatorial synthesis in drug design
8	Unit 1	Factor affecting bioactivity
9	Unit 1	QSAR- Free Wilson analysis
10	Unit 1	Hansch analysis
11	Unit 1	Relationship between free Wilson analysis and Hansch analysis
12	Unit 2	Pharmacodynamics-introduction
13	Unit 2	Elementary treatment of enzymes stimulation
14	Unit 2	Elementary treatment of enzymes stimulation
15	Unit 2	Enzymes inhibition
16	Unit 2	Sulphonamides-introduction,structure,properties
17	Unit 2	Synthesis of sulphonamides drugs
18	Unit 2	Membrane active drugs
19	Unit 2	Drug metabolism
20	Unit 2	Xenobiotics
21	Unit 2	Biotransformation
22	Unit 2	Significance of drug metabolism in medicinal chemistry
23	Unit 2	Significance of drug metabolism in medicinal chemistry
24	Unit 3	Antibiotics and antibacterials drugs introduction
25	Unit 3	Antibiotic Lacam type- penicillins
26	Unit 3	Antibiotic Lacam type- penicillins
27	Unit 3	Antibiotic Lacam type- cephalosporins
28	Unit 3	Antibiotic Lacam type- cephalosporins
29	Unit 3	Anti-tubercular drugs
30	Unit 3	Anti-tubercular drugs
31	Unit 3	Streptomycin
32	Unit 3	Streptomycin
33	Unit 3	Broad spectrum antibiotics tetracyclines
34	Unit 3	Broad spectrum antibiotics tetracyclines
35	Unit 3	Anticancer-Dactinomycin(AntinomycinD)

36	Unit 3	Anticancer-Dactinomycin(AntinomycinD)

37	Unit 4	Antifungal drugs introduction
38	Unit 4	Polyenes
39	Unit 4	Antibacterial ciprofloxacin
40	Unit 4	Antibacterial ciprofloxacin
41	Unit 4	Antibacterial Norfloxacin
42	Unit 4	Antibacterial Norfloxacin
43	Unit 4	Antiviral
44	Unit 4	Acyclovir
45	Unit 4	Antimalaria drugs
46	Unit 4	Chemotherapy of malaria
47	Unit 4	SAR
48	Unit 4	Chloroquine
49	Unit 4	Chloroguanide
50	Unit 4	Mefloquin
51	Unit 5	Non-sterodial anti-inflammatory drugs
52	Unit 5	Diclofenac sodium
53	Unit 5	Diclofenac sodium
54	Unit 5	Ibunrofen
55	Unit 5	Ibunrofen
56	Unit 5	Nefopam
57	Unit 5	Nefopam
58	Unit 5	Antihistaminic and antiasthmatic agents
59	Unit 5	Terfenadine
60	Unit 5	Terfenadine
61	Unit 5	Cinnarizine
62	Unit 5	
63	Unit 5	Salbutamol
64	Unit 5	Salbutamol
65	Unit 5	Beclomethasone dipropionate
66	Unit 5	Beclomethasone dipropionate

Maharaja Ranjit Singh College of Professional Sciences, Indore

Department of Chemical Sciences

Lesson Plan - **M. Sc. IV Sem. (Jan 2021 - June 2021)**

Subject - **Inorganic Chemistry Practical**

Teacher **- Prof. Seema Shintre**

Day/Lecture	Unit	Topic
		Preparation: to prepare the following
1	1	Synthesis of metal acetylacetonate
2	2	Metal complex of DMSO
3	3	Determination of Cr(III) complex
4	4	$[Co(NH_3)_5(NO_2)]Cl$
5	5	Synthesis of metal- ethylene diamine complex
6	6	$[Co(NH_3)_5Cl]Cl_2$
		Ion Exchange Chromatography
7	1	Capacity of cation /anion exchange resin
8	2	Separation of cobalt and nickel on anion exchange resin & their estimation volumetrically
		Spectrophotometric Determinations/ Spectroscopic identification of recorded spectra like IR, NMR, ESR & Mass
9	1	Manganese/ Chromium in steel sample
10	2	Nickel by extractive spectrophotometric method
11	3	Flouride/ Nitrite/ Phosphate
		Flame photometric determination
12	1	Sodium & Potassium when present together
13	2	Lithium / Calcium/ Barium/ Strontium

Maharaja Ranjit Singh College of Professional Sciences, Indore

Department of Chemical Sciences

Lesson Plan - **M. Sc. IV Sem. (Jan 2021 - June 2021)**

Subject - **Organic Chemistry Practical**

Teacher - **Dr. Lal Kumar**

Day/Lecture	Unit	Topic
1	I	To prepare and submit soap from fat or oil
2	I	To isolate Caffiene from tea leaves
3	I	To isolate Casiene from milk
4	I	To isolate Lactose from milk
5	I	To isolate Lycopine from Tomatos
6	I	To prepare and submit Rose water using steame distillation from rose petals
7	I	Multi Step Synthesis
8	I	To prepare and submit benzanilide from benzophenone oxime
9	I	To estimate Glucose quantitatively by the spectroscopic method or colorimeter
10	I	To identified organic compound by the analysis of their IR spectra (Phenol)
11	I	To identified organic compound by the analysis of their IR spectra (Toluene)
12	I	To identified organic compound by the analysis of their IR spectra (Aniline)

Maharaja Ranjit Singh College of Professional Sciences, Indore

Department of Chemical Sciences

Lesson Plan - **M. Sc. IV Sem. (Jan 2021 - June 2021)**

Subject - **Physical Chemistry Practical**

Teacher **- Prof. Deepanshu Pandey**

Day/Lecture	Unit	Topic
1	Sec A	**Spectroscopy :**
2		Determination of pKa of an indicator in aqueous & micellar media
3		Determination of stoichiometry & stability constant of Ferric isothiocyanate ion complex in solution
4		Determination of rate constant of alkaline bleaching of Malachite green & effect of ionic strength on the rate of reaction
5		**Polarography / Electronics :**
6		Identification & estimation of metal ions such as Cd2+, Pb2+, Zn2+ & Ni2+ etc polarographically
7		Study of a metal ligand complex polarographically Using lingane's method
8		Determination of the V-I characteristic of a given diodes in :
9		(a) Forward based mode / function
10		(b) Reverse based mode / function
11		**Chemical Kinetics :**
12		Determination of rate constant & formation of an intermediate complex in the reaction of Ce(IV) & hypophosphorus acid at ambient temperature
13		acid medium
14		Determination of energy of activation & entropy of activation from single kinetic run
15		Kinetics of an enzyme catalysed reaction
16		**Thermodynamics :**
17		Determination of partial molar volume of solute & solvent in a binary mixture.
18		Determination of temperature dependence of the solubility of a compound in two solvents having similar intramolecular interaction
19		calculate the partial molar heat of solution

Maharaja Ranjit Singh College of Professional Sciences, Indore

Department of Chemical Science

Lesson Plan - M. Sc. I (July 2020 -Dec 2020)

Subject - Inorganic Chemistry-I

Teacher - Prof. Seema Shintre

Day/Lecture	Unit	Topic
	1	**Stereochemistry and bonding in main group compounds**
1		VSEPR theory introduction
2		Rules of VSEPR theory with example
3		Rules of VSEPR theory with example
4		Rules of VSEPR theory with example
5		dπ-pπ bond
6		dπ-pπ bond
7		Bent rule
8		Walsh diagram for triatomic molecule
9		Walsh diagram for penta-atomic molecule
10		Energy of hybridisation
		some simple reaction of covalently bonded molecule
11		Free radical reaction
12		Nucleophilic displacement reaction
13		Atomic inversion reaction
14		Barry pseudorotation reaction
	2	**Metal-Ligand Equilibria in Solution**
15		Thermodynamic stability and kinetic stability
16		Stepwise formation and overall formation of complexes
17		Relationship between stepwise and Overall stability constants
18		Steric hinderance
19		Factors affecting the stability of metal complexes
20		Properties of CMI - Charge and size
21		Crystal field effects and natural order , Electronegativity of CMI
		Properties of ligands- size and charge of ligand
22		Basic character of ligands, Chelate effect
23		Steric Effects and Chelate ring size
		Experimental determination of stability constants of complex
24		Spectro photometric method
25		Potentiometric method

	3	**Reaction mechanism of transition metal complexes**
26		Energy profile of a reaction
27		Inert and Labile complexes
28		Kinetic application of VBT
29		Reaction of metal complexes- Acid dissociation reaction
30		Exchange reaction: SN reaction(SN1 and SN2)
31		Electrophilic substitution reaction
32		Electron-transfer reaction
33		Types of electron transfer reactions
34		Kinetics of Octahedral substitution
35		Hydrolysis reactions- Acid hydrolysis and its factors
36		Base hydrolysis
37		Evidance in favour of SN1 conjugate base mechanism
38		Anion reaction and reaction without metal ligand bond cleavage
39		Redox reaction and Outer sphere type reaction
40		Cross reaction and Marcus Hush theory
41		Inner sphere type reactions.
	4	**Metal-Ligand bonding**
42		Crystal field theory
43		Limitations of CFT
44		Limitations of CFT
45		Molecular orbital theory
46		MOT for bonding in Octaheral complexes
47		MOT for bonding in Tetrahedral complexes
48		MOT for bonding in Square planar complexes
49		π bonding theory
	5	**HSAB theory**
50		Classification of acids and bases
51		HSAB principle
52		Lewis acid base reactivity approximation
53		Donar and acceptor numbers
54		E and C equation
55		Applications of HSAB concept

Maharaja Ranjit Singh College of Professional Sciences, Indore		
Department of Chemical Sciences		
Lesson Plan - M. Sc. I Sem (July 2020 -Dec 2020)		
Subject - Organic Chemistry- I		
Teacher - Dr Dipak Sharma		
Day/Lecture	**Unit**	**Topic**
1	1	Nature of bonding in organic molecules, Delocalized chemical bonding
2		Conjugation, cross conjugation
3		Resonance, Hyperconjugation
4		Bonding in fullerences, tautomerism
5		Aromaticity in benzenoid and non benzoid compounds,
6		Alternate and non alternate hydrocarbons
7		Huckels rule, energy level of pi molecular orbitals
8		Annulenes, anti-aromaticity, homo-aromaticity
9		PMO approache, bonds weaker than covalent-addition compounds
10		Crown ether complexs and cryptands
11		Inclusion compounds
12		Catenanes and rotaxanes
13	2	Stereochemistry: Strain due to unavoidable crowding
14		Elements of symmetry
15		Chirality, molecules with more than one chiral center
16		Threo and ertythro isomers
17		Methods of resoluation
18		Opetical purity
19		Enantiotopic and diastereotopic atoms, groups and faces
20		Stereospecific synthesis
21		Stereoselective synthesis
22		Asymmetric synthesis
23		Opetical activity in the absence of chiral carbon (biphenyls, allenes and spirane)
24		Stereochemistry of the compounds containing N, S, P
25	3	Conformational analysis and linear free energy relationship
26		Conformational analysis of cycloalkanes,
27		Decalines,
28		Effect of conformation on reactivity
29		Conformation of sugars
30		Generation, structure, stability and reactivity of carbocations
31		Carbanions
32		Free radicals
33		Carbenes and Nitrenes
34		The Hammett equation and Linear free energy relationship
35		Substituents and reaction constants

36		Taft equation

37	4	Reaction mechanism: structure and reactivity. Types of mechanisms
38		Types of reactions
39		Thermodynamic and kinetic requirements
40		Thermodynamic and kinetic requirements
41		Kinetic and thermodynamic control
42		Kinetic and thermodynamic control
43		Hammonds posttulate
44		Curtir Hammett principal
45		Potential energy diagrams, transition states and intermediates
46		Methods of determining mechanism
47		Isotopes effects
48	5	Aliphatic Nucleophilic Substitution: The SN2,
49		SN1
50		Mixed SN1 and SN2, SET mechanism
51		The neighboring group mechanism, neighboring group participation by p and s bonds, anchimeric assistance
52		Classical and nonclassical carbocations, phenonium ions,
53		Norbornyl systems, common carbocation rearrangements
54		Application of NMR spectroscopy in the detection of carbocations
55		Nucleophilic substituation at an allylic, aliphatic trigonal carbon
56		Nucleophilic substituation at a vinylic carbon
57		Reactivity effects of substrate structure, attacking nucleophile, leaving group and reaction medium
58		Phase transfer catalysis and ultrasound
59		Ambident nucleophile
60		Regioselectivity

Maharaja Ranjit Singh College of Professional Sciences, Indore

Department of Chemical Sciences

Lesson Plan - M. Sc. I Sem. (July 2020 -Dec 2020)

Subject - Physical Chemistry Practical

Teacher - Prof. Deepanshu Pandey

Day/Lecture	Unit	Topic
1	unit 1	**Introduction to quantum mechanical results**
2	unit 1	Schrodinger equation and derivation
3	unit 1	postulates of quantum mechanics
4	unit 1	discussion of solution of the equation viz. Particle in a box.
5	unit 1	discussion of sol. of the eq. viz. the harmonic oscillators
6	unit 1	discussion of sol. of the eq. viz. the rigid rotor
7	unit 1	discussion of sol. of the eq. viz. the hydrogen atom
8	unit 1	discussion of sol. of the eq. viz. the helium atom
9	unit 1	limitation of schrodinger theory
10	unit 1	Revision session on completion of unit.
11	unit 2	**Introduction : Approximation Methods**
12	unit 2	The variation theorem: Linear variation principle
13	unit 2	Perturbation theory(first order and non degenerate)
14	unit 2	Application of variation method
15	unit 2	Perturbation theory to the Helium atom
16	unit 2	**Molecular Orbital Theory : Introduction**
17	unit 2	Huckel theory of conjugated systems bond
18	unit 2	charge density & its calculations
19	unit 2	Application of Huckel thoery to ethylene
20	unit 2	Application of Huckel thoery to butadiene
21	unit 2	Application of Huckel thoery to cyclopropenyl radical
22	unit 2	Application of Huckel thoery to cyclobutadiene
23	unit 2	Introduction to extended Huckel theory
24	unit 2	**Revision session on completion of unit.**

25	unit 3	Angular Momentum : Introduction
26	unit 3	Ordinary angular momentum,generalized angular momentum
27	unit 3	Eigen functions for angular momentum using ladder operator
28	unit 3	addition of angular momentum
29	unit 3	Spin, anti-symmetry theory
30	unit 3	Pauli's exclusion principle
31	unit 3	derivation of pauli's exclusion principle
32	unit 3	**Revision session on completion of unit.**
33	unit 4	**Classical Thermodynamics :** Laws of thermodynamics
34	unit 4	free energy, chemical potential and entropies
35	unit 4	partial molar free energy, partial molar volume,molar heat
36	unit 4	Fugacity: concept & determination of fugacity
37	unit 4	Non- Ideal systems: Excess function of non-ideal solution
38	unit 4	Activity & Activity Constant
39	unit 4	Determination of activity coeffiecients
40	unit 4	Debye-Huckel theory for activity coefficient of electrolyte sol.
41	unit 4	activity coefficient : ionic strength
42	unit 4	Application of phase rule to three component systems
43	unit 4	Second order phase transition
44	unit 4	**Revision session on completion of unit.**
45	unit 5	**Introduction : Statistical Thermodynamics**
46	unit 5	Concept of distribution and application
47	unit 5	Thermodynamics probability and most probable distribution
48	unit 5	Ensamble averaging and postulates of ensamble averaging
49	unit 5	Canonical, Grand Canonical & Micro Canonical ensambles
50	unit 5	Corresponding distribution law (using Lagrange's method)
51	unit 5	Partition function - translation, rotational,vibrational
52	unit 5	Partition function - vibrational partitions
53	unit 5	Partition function - electronic partitions
54	unit 5	Calculation of thermodynamics properties in terms of partition
55	unit 5	application of partition functions
56	unit 5	Fermi- Dirac statistics
57	unit 5	distribution law & application to metal
58	unit 5	Bose-Einstein statistics distribution law
59	unit 5	Bose-Einstein statistics distribution law & application to Helium
60	unit 5	**Revision session on completion of unit.**

Maharaja Ranjit Singh College of Professional Sciences, Indore		
Department of Chemical Science		
Lesson Plan - M. Sc. I (July 2020 -Dec 2020)		
Subject - Group Theory and Spectroscopy -I		
Teacher - Dr. Lal Kumar		
Day/Lecture	**Unit**	**Topic**
1	I	Symmetry and Group theory in Chemistry: Symmetry elements and symmetry operation
2	I	Group, subgroup, conjugacy relation and classes
3	I	Point and symmetry group
4	I	Schonfilies symbols
5	I	Repesentation of groups by matrices(representation for the Cn, Cnv, Cnh, Dnh,
6	I	Character of a representation
7	I	The great orthogonality theorem(without proof) and its importance
8	I	Character Tables and their use;spectroscopy
9	I	Derivation of character table for Cv and C3v point group symmetry aspacts of molecular vibration of H2Omolecule.
10	II	Microwave Spectroscopy: Classification of molecules,
11	II	rigid rotator model
12	II	effect of isotopic substitution on the transition frequences
13	II	intensities, non-rigid rotator
14	II	Stark effect, nuclear and electron spin interaction and
15	II	effect of external fields
16	II	Applications
17	III	Infrared Spectroscopy: Review of linear harmonic oscillator
18	III	Vibrational energies of diatomic molecules
19	III	Zero point energy
20	III	Force constant and bond strengths
21	III	Harmonicity, Morse Potential energy diagram
22	III	Vibration-rotation spectroscopy
23	III	PQR Branches, Breakdown of Oppenheimer approximation
24	III	Vibration of polyatomics molecules, selection rules
25	III	Normal mode of Vibration,
26	III	Group frequencies, Overtones, Hot bands,
27	III	Factors affecting the band positions and intensities
28	III	Far IR region, metal ligand vibrations

29	III	Coordinate Analysis

30	IV	Raman Spectroscopy: Classical theory of Raman effect
31	IV	Quantum theory of Raman effect
32	IV	Pure rotational
33	IV	Vibrational and Vibrational-rotational Raman Spectra
34	IV	Selection Rules, Mutual exclusion principle
35	IV	Resonance Raman Spectroscopy
36	IV	Coherent Anti-stokes Raman Spectroscopy (CARS)
37	V	Electronic Spectroscopy: Molecular Spectroscopy
38	V	Energy levels molecular orbitals
39	V	Vibronic transitions, vibrational progression and geometry of the excited states
40	V	Franck-Condon principle
41	V	Electronic spectra of polyatomics molecules
42	V	Emission spectra: Radio-active and non-radio active decay
43	V	Internal conversion
44	V	Spectra of transition metal complexes
45	V	Charge-transfer spectra
46	V	Photoelectron Spectroscopy: basic principle,
47	V	photo-electric effect, ionisation process
48	V	Koopmann's theorem
49	V	photoelectron spectra of simple molecules
50	V	ESCA
51	V	Chemical information from ESCA
52	V	Auger Electron spectroscopy basic idea

Maharaja Ranjit Singh College of Professional Sciences, Indore		
Department of Chemical Sciences		
Lesson Plan - M. Sc. I Sem (July 2020 -Dec 2020)		
Subject - Mathematic for Chemists		
Teacher - Prof. Manoj Joshi		
Day/Lecture	**Unit**	**Topic**
1	1	Vectors: dot
2	1	Cross
3	1	Triple products
4	1	Gradient
5	1	Divergence
6	1	Curl
7	1	Vector calculus
8	1	Matrix algebra: Addition
9	1	Multiplication
10	1	Inverse
11	1	Adjoint
12	1	Transpose
13	2	Differential calculus
14	2	Functions
15	2	Continuity
16	2	Differentiability
17	2	Rules for differentiation
18	2	Applications of differential calculus including maxima and minima
19	2	Maximally populated rotational energy levels
20	2	Maximally populated rotational energy levels
21	2	Bohrs radius
22	2	Bohrs radius
23	2	Most probable velocity from Maxwells distribution
24	2	Most probable velocity from Maxwells distribution
25	3	Integral calculus
26	3	Basic rules for integration
27	3	Basic rules for integration
28	3	Integration by parts
29	3	Partial fractions and substitution
30	3	Partial fractions and substitution
31	3	Reduction formulae
32	3	Applications of integral calculus
33	3	Functions of several variables
34	3	Partial differentiation
35	3	Co-ordinate transformations
36	3	Example: Cartesian to spherical polar

37	4	Elementary differential equations
38	4	First order and first degree differential equations
39	4	First order and first degree differential equations
40	4	Homogenous
41	4	Exact and linear equations
42	4	Applications to chemical kinetics
43	4	Secular equilibria
44	4	Quantum chemistry
45	4	Sccond order differential equation and their solutions
46	4	Sccond order differential equation and their solutions
47	5	Permutation and probability
48	5	Permutations and combinations
49	5	Permutations and combinations
50	5	Permutations and combinations
51	5	Probability and probability theorems average
52	5	Probability and probability theorems average
53	5	Probability and probability theorems average
54	5	Variance
55	5	Root means square deviation
56	5	Examples from the kinetic theory of gases etc
57	5	Examples from the kinetic theory of gases etc
58	5	Fitting
59	5	Least squares fit etc with a general polynomial fit
60	5	Least squares fit etc with a general polynomial fit

Maharaja Ranjit Singh College of Professional Sciences, Indore		
Department of Chemical Sciences		
Lesson Plan - M.Sc. I Sem Chemistry (July 2020 -Dec 2020)		
Subject - Biology for chemists		
Teacher - Dr. Mukesh Gupta		
Day/Lectur	**Unit**	**Topic**
1	Unit 1	Cell structure and functions,structure prokaryotic and eukaryotic
2		Intracellular organelles and their functions
3		Comparasion of plant and animal cells
4		Overview and function
5		Comparasion of plant and animal cells
6		Overview of metabolic processes-catabolism and anabolism
7		ATP-the biology energy currency
8		Origin of life-unique properties of carbon chemical evolutionand rise of living systems
9		Origin of life-unique properties of carbon chemical evolutionand rise of living systems
10		Introduction to bio-molecules
11		Building blocks of bio-macromolecules
12	Unit 2	Carbohydrate-conformation of monosaccharides
13		Structure and funtion of important derivatives of monosaccharides like glycosides
14		Structure and funtion of important derivatives of monosaccharides like deoxy sugars
15		Structure and funtion of important derivatives of monosaccharides like myoinositol
16		Structure and funtion of important derivatives of monosaccharides like amino sugars
17		Structure and funtion of important derivatives of monosaccharides like N-acetylmuramic acid
18		Structure and funtion of important derivatives of monosaccharides like sialic acid
19		Structure and funtion of important derivatives of monosaccharides like disaccharides
20		Structural polysaccharides cellulose and chitin
21		Storage of polysaccharides- starch and glycogen
22		Storage of polysaccharides- starch and glycogen
23		Structural and biological function of glucosaaminoglycans of mucopolysaccharides
24		Structural and biological function of glucosaaminoglycans of mucopolysaccharides
25		Carbohydrate of glycoproteins and glycolipids
26		Role of sugar in biological recognition
27		Blood sugar substances
28		Ascorbic acid
29	Unit 3	Lipid- fatty acids, essential fatty acids
30		Structure and function of triacylglycerols
31		Structure and function of glycerophospholipids
32		Structure and function of sphingolipids
33		Structure and function of cholesterol
34		Structure and function of bile acids
35		Structure and function of prostaglandins
36		Liproproteins-compositionand function role in atherosclerosis
37		Properties of lipid aggregates-micelles,bilayers,liposomes and their possible biological function
38		Properties of lipid aggregates-micelles,bilayers,liposomes and their possible biological function
39		Properties of lipid aggregates-micelles,bilayers,liposomes and their possible biological function
40		Biological membranes
41		Fluid mosaic model of membrane structure
42		Lipid metabolism beta-oxidation of fatty acids

43	Unit 4	Amino-acid, properties and proteins
44		Chemical and enzymatic hydrolysis of proteins to peptides,amino acid sequencing
45		Chemical and enzymatic hydrolysis of proteins to peptides,amino acid sequencing
46		Chemical and enzymatic hydrolysis of proteins to peptides,amino acid sequencing
47		Secondary structure of proteins
48		Forces responsible for holding of secondary structure
49		alpha-helix,beta-sheets
50		super secondary structure,triple helix structure of collagen
51		Tertiary structure of protein-folding and domain structure
52		Quaternary structure
53		Amino acid metabolism -degradation and biosynthesis of amino acid
54		Sequence determination:chemical
55		Sequence determination:enzymatic
56		Sequence determination:mass spectral
57		Sequence determination:recemization
58		Sequence determination:detection
59		Chemistry of oxytoin and tryptophan releasing hormone (TRH)
60	Unit 5	Nucleic acids, purine and pyrimidine bases of nucleic acid
61		Base pairing via H-bonding
62		Structure of ribonucleic acids(RNA) and deoxyribonucleic acid(DNA)
63		Structure of ribonucleic acids(RNA) and deoxyribonucleic acid(DNA)
64		Double helix model of DNA and forces responsible for holding it
65		Chemical and enzymatic hydrolysis of nucleic acid
66		The chemical basis for heredity
67		An overviewof replication of DNA, transcription,translationand genetic code
68		An overviewof replication of DNA, transcription,translationand genetic code
69		Chemical synthesis of mono and tri nucleoside

Maharaja Ranjit Singh College of Professional Sciences, Indore

Department of Chemical Sciences

Lesson Plan - M. Sc. I Sem. (July 2020 -Dec 2020)

Subject - Inorganic Chemistry Practical

Teacher - Prof. Seema Shintre

Day/Lecture	Unit	Topic
	1	**Qualitative Analysis**
1	A	Analysis of less common metal ions: W, Mo,Ti, Zr, V etc.
2	B	Analysis of insoluble residue: Oxides, Sulphates and halides
3		Analysis of insoluble residue: Oxides, Sulphates and halides
	2	**Quantitative Analysis(Gravimetrically and volumetrically)**
4		Seperation & estimation of two metal ions Cu-Zn
5		Seperation & estimation of two metal ions Fe-Mg
6		Seperation & estimation of two metal ions Ni-Zn
		Chromatography
7		Seperation, identification and determination of cations by Paper chromatography
8		Seperation, identification and determination of cations by Paper chromatography
9		Seperation, identification and determination of anions by Paper chromatography
		Preparations
		To prepare and submit selected inorganic complexes
10		VO(acac)2
11		Ni(acac)2
12		[Co(NH3)6]Cl3
13		Reinecke's salt
14		Prussian Blue
15		Oxalate complexes of Chromium(III)
16		Oxalate complexes of Copper(II)

Maharaja Ranjit Singh College of Professional Sciences, Indore		
Department of Chemical Sciences		
Lesson Plan - M. Sc. I Sem. (July 2020 -Dec 2020)		
Subject - Organic Chemistry Practical		
Teacher - Dr. Lal Kumar		
Day/Lecture	**Unit**	**Topic**
1	Part I	Qualitative Anaysis
2	1	To separate and identify the given organic mixture having three solid organic compounds
3	2	To separate and identify the given organic mixture having three solid organic compounds
4	3	To separate and identify the given organic mixture having three solid organic compounds
5	4	To separate and identify the given organic mixture having three solid organic compounds
6	5	To separate and identify the given organic mixture having two solid and one liquid organic compounds
7	6	To separate and identify the given organic mixture having two solid and one liqiud organic compounds
8	Part II	Organic Synthesis
9	1	To prepare and submit Aspirin (Acetylation Reaction)
10	2	To prepare and submit adipic acid from cyclohexene
11	3	To prepare and submit meta-dinitroaniline from meta-dinitrobenzene
12	4	To prepare and submit para-nitroacetanilide from acetanilide

Maharaja Ranjit Singh College of Professional Sciences, Indore		
Department of Chemical Sciences		
Lesson Plan - M. Sc. I Sem. (July 2020 -Dec 2020)		
Subject - Physical Chemistry Practical		
Teacher - Prof. Deepanshu Pandey		
Day/Lecture	Unit	Topic
1	Sec A	Error Analysis & Stattistical Data Analysis
2	Sec A	Error, types of error, minimization of errors
3	Sec A	distribution curves precision , accuracy & combination
4	Sec A	Statistical treatment for error analysis
5	Sec A	Student's t-test, null hypothesis
6	Sec A	rejection criteria
7	Sec A	F& Q- test
8	Sec A	Linear regression analysis, curve fitting
9	Sec A	calibration of volumetric appratus : Burette,Pipette & Std. Flask
10	Sec A	Adsorption: To study surface tension Gibb's Equation
11	Sec A	Phase Equilibrium :
12	Sec A	Determination of congruent composition and temperature of a binary system
13	Sec A	Determination of glass transition temperature of a given salt conductometrically
14	Sec A	Construct the phase diagram for three component system
15	Sec B	Chemical Kinetics : Determination of the effect of (a) change of temperature
16	Sec B	(b) change of concentration of reactant & catalyst
17	Sec B	(c) ionic strength of the media on the velocity of hydrolysis of an ester
18	Sec B	Determination of the velocity constant of hydrolysis of an ester in micellar
19	Sec B	Determination of velocity constant for theoxidation of iodide ions by H2O2 .
20	Sec B	Flow clock reaction
21	Sec B	Determination of primary salt effect on the kinetics of ionic reaction
22	Sec B	Solution : Determination of molecular weight of non-volatile & electrolyte by cryoscopic
23	Sec B	Determination of the degree of dissociation of weak electrolyte

Maharaja Ranjit Singh College of Professional Sciences, Indore
Department of Chemical Science
Lesson Plan - M. Sc. II (Jan 2020 - June 2020)
Subject - Organic Chemistry-II
Teacher - Dr. Dipak Sharma

Day/Lecture	Unit	Topic
1	1	Aromatic Electrophilic Substitution: The arenium ion mechanism, orientation and reactivity, energy profile diagrams
2		The ortho/para ratio, ipso attack, orientation in other ring systems
3		Quantitative treatment of reactivity in substrates and electrophiles
4		Diazonium coupling
5		Vilsmeir reaction
6		Gatterman Koch reaction
7		Atomatic Nucleophilic Substitution: The SNAr, SN1
8		SN2 and benzyne mechanism
9		Reactivity effect of substrate structure, leaving group and attacking nucleophilie
10		Von Richter rearrangement
11		Sommelet-Hauser rearrangement
12		Smiles rearrangement
13	2	Free radical reactions: Types of free radical reactions
14		Free radical substitution mechanism
15		Mechanism at an aromatic substrate
16		Neighbouring group assistance
17		Reactivity for aliphatic and aromatic substrates at a bridgehead.
18		Reactivity in the attacking radicles. The effect of solvents on reactivity
19		Allylic halogenation (NBS)
20		oxidation of aldehydes to carboxylic acids, auto-oxidation
21		Coupling of alkynes and arylation of aromatic compounds by diazonium salts
22		Sandmeyer reaction
23		Free radical rearrangement
24		Hunsdiecker reaction
25	3	Mechanistic and stereochemical aspects of addition reaction involving electrophilies
26		Mechanistic and stereochemical aspects of addition reaction involving nucleophiles
27		Mechanistic and stereochemical aspects of addition reaction involving free radicals
28		regio and chemo selectivity
29		regio and chemo selectivity
30		orientation and reactivity
31		Addition to cyclopropane ring
32		Hydrogenation of double and triple bonds
33		Hydrogenation of aromatic rings
34		Hydroboration
35		Michael reaction
36		Sharpless asymmetric epoxidation

37	4	Addition to carbon-hetero multiple bonds. Mechanism of metal hydride reduction of saturated and unsaturated carbonyl compounds, acid esters and nitriles
38		Mechanism of metal hydride reduction of saturated and unsaturated carbonyl compounds, acid esters and nitriles
39		Addition of Grignard reagents, organozinc and organolithium reagents to carbonyl compounds
40		Addition of Grignard reagents, organozinc and organolithium reagents to carbonyl compounds
41		Witting reaction, mechanism of condensation reactions involving enolates-aldol reaction
42		Witting reaction, mechanism of condensation reactions involving enolates-Knoevenagel, Claisen, Mannich reactions
43		Mechanism of condensation reactions involving enolates- Benzoin, Perkin and Stobbe reactions
44		Hydrolysis of esters and amides, ammonolysis of esters
45		The E2, E1 and E1cB mechanism and their spectrum
46		Orientation of the double bonds
47		Reactivity-effects of substrate structures, attacking base, the leaving group and the medium
48		Mechanism and orientation in pyrolytic elimination
49	5	Pericyelic reactions: Molecular orbital symmetry
50		Frontier orbitals of ethylene, 1,3-butadiene, 1,3,5-hexatriene and allyl system
51		Classification of periycyclic reactions, Woodward-Hoffmann correlation diagrams
52		FMO and PMO approach
53		Electrocyclic reactions-conrotatory and disrotatory motions, 4n, 4n+2 and allyl systems
54		Cycloadditions-antarafacial and suprafacial additions, 4n, 4n+2 systems, 2+2 addition of ketenes
55		1.3 dipolar cycloadditions and cheleotrpic reactions
56		Sigmatropic rearrangements-suprafacial and antarafacial shifts of H
57		Sigmatropic involving carbon moieties, 3,3-and5,5 sigmatropic rearrangements
58		Claisen, cope and aza-cope rearrangements
59		Fluxional tautomerism
60		Ena reaction

Maharaja Ranjit Singh College of Professional Sciences, Indore

Department of Chemical Sciences

Lesson Plan - M. Sc. II Sem. (Jan 2020 - June 2020)

Subject - Inorganic Chemistry-II

Teacher - Prof. Seema Shintre

Day/Lecture	Unit	Topic
	1	**Electronic spectral studies of Transition metal complexes**
1		Spectroscopic ground states
2		orgel diagram for transition metal complexes(d1to d9)
3		orgel diagram for octahedral geometry of transition metal complexes(d1to d9)
4		orgel diagram for tetrahedral geometry of transition metal complexes
5		Tanabe-sugano diagrams for transition metal complexes
6		Tanabe-sugano diagrams for transition metal complexes
7		Correlation diagram
8		Selection rule for electronic spectroscopy
9		Spin selection rule and Laport selection rule
10		Intensity of various type of electronic transition
11		Charge transfer spectra
12		Calculation of 10Dq, B and β parameters
	2	Magnetic properties of transition metal complexes
13		Anamalous magnetic moments
14		Quenching of orbital contribution
15		Orbital contribution to magnetic moment
16		Orbital contribution to magnetic moment
17		Magnetic exchange coupling and spin crossover
	3	Metal π complexes
18		Metal carbonyl ,structure and bonding
19		Vibrational spectra of metal carbonyls for bonding and structure elucidation
20		Vibrational spectra of metal carbonyls for bonding and structure elucidation
21		Important reaction of metal carbonyls and its preparation
22		Structure and bonding in metal carbonyl
23		Important reaction of metal nitrosyl and its preparation
24		Dinitogen and dioxygen complexes
25		Tertiary phosphine as ligand

4 Metal-Clusters

26 Highar boranes: classification and structure

27 Highar boranes: bonding, preparations, properties and uses

28 Carboranes: preparation, properties and uses

29 metalloboranes: preparation, properties and uses

30 metallo-carboranes compounds with metal metal multiple bond

31 metallo-carboranes compounds with metal metal multiple bond

5 Optical rotatory dispersion and circular dichroism

32 Linearly and circularly polarized lights

33 optical rotatory power and circular birefringence

34 ORD and CD

35 Cotton effect

36 Faraday and Kerr effects

37 Assignment of electronic transitions

38 Application of ORD and CD

39 Application of ORD and CD

Maharaja Ranjit Singh College of Professional Sciences, Indore

Department of Chemical Sciences

Lesson Plan - M. Sc. II Sem. (Jan 2020 - June 2020)

Subject - Physical Chemistry Practical

Teacher - Prof. Deepanshu Pandey

Day/Lecture	Unit	Topic
1	Unit 1	Chemical Dynamics : Introduction, Defining Rate Law
2	Unit 1	Methods of determining rate laws
3	Unit 1	collision theory of reaction rates
4	Unit 1	steric factor,activated complex theory, Arrhenius equation
5	Unit 1	Ionic reaction, Kinetic salt effects
6	Unit 1	Steady state kinetics
7	Unit 1	Kinetics and thermodynamics control of reactions
8	Unit 1	Treatment of unimolecular reactions
9	Unit 1	Dynamic chain reaction (hydrogen- bromine reaction)
10	Unit 1	Pyrolysis of acetaldehyde, decomposition of ethane
11	Unit 1	Photochemical reaction (hydrogen- bromine reaction)
12	Unit 1	Photochemical reaction (hydrogen-chlorine reaction)
13	Unit 1	Homogeneous catalysis Kinetics of enzyme reaction
14	Unit 1	General characteristic of fast reaction
15	Unit 1	Study of fast reaction by flow method
16	Unit 1	Relaxation method , flash photolysis
17	Unit 1	nuclear magnetic resonance method
18	Unit 1	Dynamics of unimolecular reactios: Lindemann Hinshelwood
19	Unit 1	Rice- Ramsperger kassel Marcus theories for unimolecular
20	Unit 1	Revision after completion of chapter
21	Unit 2	**Surface Chemistry: Adsorption :** Introduction
22	Unit 2	Surface Tension, Capillary action,
23	Unit 2	Vapour pressure of droplets (Kelvin equation)
24	Unit 2	Gibbs adsorption isotherm
25	Unit 2	estimation of surface area(BET equation)
26	Unit 2	Surface films on liquids (Electro-Kinetic phenomenon)
27	Unit 2	**Micelles:** Surface active agents
28	Unit 2	Classification of surface active agents
29	Unit 2	micellezation,hydrophobic interaction,Critical Micellar Conc.
30	Unit 2	Factor affecting CMC of surfactant
31	Unit 2	counter ion binding to micelles, thermodynamics of micellization
32	Unit 2	Phase seperation & mass action models
33	Unit 2	Solublization,Micro emulsion reverse micelles
34	Unit 2	Revision on completion of unit
35	Unit 3	**Macromolecules :** Polymers-defination and types
36	Unit 3	electrically conducting, Fire resistant, liquid crystal polymers
37	Unit 3	Kinetics of polymerization, mechanism of polymerization
38	Unit 3	Molecular mass, mass average molecular mass
39	Unit 3	molecular mass determination
40	Unit 3	osmometry , viscometery, diffusion
41	Unit 3	light scattering methods ,sedimentation
42	Unit 3	number average molecular mass
43	Unit 3	chain configuration of macromolecules
44	Unit 3	calculation of average dimension of various chain structures
45	Unit 3	Revision on completion of unit

46	Unit 4	Non-equilibrium Thermodynamics:Thermodynamic criteria
47	Unit 4	entropy production and entropy flow
48	Unit 4	entrophy balanced equation for different irreversible process
49	Unit 4	transformation of generlized fluxes and forces
50	Unit 4	Non-equilibrium stationary states
51	Unit 4	phenomenological equations, microscopic reversibilty
52	Unit 4	onsager reciprocity relation
53	Unit 4	Electrokinetic phenomena
54	Unit 4	diffussion, electric conduction
55	Unit 4	Revision on completion of unit
56	Unit 5	Electrochemistry :Debye Huckel Onsager treatment
57	Unit 5	Solvent interaction, Debye Huckel jerum mode
58	Unit 5	Thermodynamics of electrified interface equation
59	Unit 5	Derivation of electro capillarity, Lippmann equation
60	Unit 5	Structure of electrified interfaces, Over potential exchange current
61	Unit 5	Butler Volmer equation , Tafel plot, quantization of charge
62	Unit 5	tunneling, theory of double layer at semiconductor
63	Unit 5	effect of light on solution,Polarography theory,Ilkovic equation
64	Unit 5	Half wave potential & its significance
65	Unit 5	Revision on completion of unit

Maharaja Ranjit Singh College of Professional Sciences, Indore

Department of Chemical Sciences

Lesson Plan - M. Sc. II Sem. (**Jan 2021 - June 2021**)

Subject - Spectroscopy and Diffraction Methods-II

Teacher - Dr. Lal Kumar

Day/Lecture	Unit	Topic
1	**I**	**Nuclear Magnetic Resonance Spectroscopy**
2	I	Nuclear spin, Nuclear Resonance
3	I	Saturation
4	I	Shielding and deshielding of magnetic nuclei
5	I	Chemical Shift and its measurements
6	I	Factors influencing chemical Shift
7	I	Spin-Spin Interactions
8	I	Factors influencing coupling constant "J" value Classification (AXB, ABC, AMX, A2B2, etc)
9	I	Spin decoupling
10	I	Basic ideas about instrument
11	I	NMR Studies of nuclei other than proton 13C, 19F, and 31P FT-NMR
12	I	Advantages of FT-NMR
13	**II**	**Nuclear Quadrupole Resonance Spectroscopy**
14	II	Quadrupole Nuclei
15	II	Quadrupole Moments
16	II	Electric Field Gradient
17	II	Coupling Constant
18	II	Splitting
19	II	Application of NQR Spectroscopy
20	**III**	**Electron Spin Resonance Spectroscopy**
21	III	Basic principles ESR
22	III	Zero field splitting and
23	III	Kramer's degenracy
24	III	Factors affecting the g-value
25	III	Isotropic and Anisotropic
26	III	Hyperfine coupling constants
27	III	Spin Hamiltonian
28	III	Spin densities and Mc Connell relationship
29	III	Measurement techniques
30	III	Application of ESR Spectroscopy

31	**IV**	**X-rays Diffraction**
32	IV	Bragg condition
33	IV	Miller Indices
34	IV	Laue Method
35	IV	Bragg Method
36	IV	Debye Scherer method of x-ray structural analysis of crystals
37	IV	index refelections
38	IV	identification of unit cells from systematic absences in diffraction patters
39	IV	Structure of simple lattices
40	IV	x-rays intensities
41	IV	Structure factor and its relation to intensity and electron density
42	IV	phase problem
43	IV	Description of the procedure for an X-ray structure analysis
44	IV	Absolute congiguration of molecules
45	**V**	**Electron Diffraction (Part A)**
46	V	Scattering intensties vs. scattering angle
47	V	Wierl equation, measurement techniques
48	V	elucidation of structure of simple gas phase molecules
49	V	low energy electron diffraction
50	V	structure of surfaces
51		**Neutron Diffraction (Part B)**
52	V	Scattering of neutrons by solids measurement techniques
53	V	elucidation of structure of magnetically ordered unit cells

Maharaja Ranjit Singh College of Professional Sciences, Indore
Department of Chemical Sciences
Lesson Plan - M.Sc. - II Sem (**Jan 2021 - June 2021**)
Subject - Computer for Chemist
Teacher - **Prof. Pravin Kumar Sharma**

Day/Lecture	Unit	Topic
1	I	Introduction of computer and its components with the help of block diagram and characteristics
2	I	Classification of computer with hierarchical diagram: Purpose, Data Handling and Functionality
3	I	Generation of Computers on the bassis: Period, Technology, Languages, Memory, Important computers, Merits and Demerits
4	I	Input and Output devices and their functions
5	I	Memroy and its Classification: Primary(RAM, ROM and its types)
6	I	Secondary Memory:Sequential Access and Direct Access(Manetic Tape, Magnetic disk, Optical disk
7	I	What is Program, software and types of software,
8	I	Programming language and its types: High lvel, Middle level and Low level
9	I	Introduction of Operating system and its logical architecture
10	I	Types and functions of operating system
11	I	Difference between CLI/GUI operating system(DOS, Windows and UNIX)
12	II	Tools of Programming Languages: Algorithm, its keyword and advantage and disadvantages, Flowchart, its notations
13	II	Introduction of C Language and its histirical development, types of C
14	II	Keywords, Identifiers, Literals, Constant and Variables
15	II	What is Instruction?, types of Instructions used in C: Arithemtic, Control, I/O and type declaration
16	II	Data types used in C language: Primary, Pointer, Derived, Void, User defined
17	II	Statements in C Language: Expression, Compound and Control
18	II	Decision control statement: if, if-else and conditional, nested-if-else
19	II	Operator and its types: Arithmetic, Relational, Logical, Increment and Decrement, Condition, bitwise and Special
20	II	Hierachy of operators, Loop control structres: for, while, do-while and Odd
21	II	Jumping Statements: goto, break and continue,
22	II	Case control structures: switch() and exit()
23	II	Difference between for, while and do-while loop control structures
24	II	Function and its types: Library and User-defined

25	III	Program to print addtion, substraction, multiplication and division
26	III	Program to caluclate factoral of given number
27	III	Program to print table of given number
28	III	Program for Vander wall equation
29	III	Program to calculate Normality, Molarity and Molality of solutions
30	III	Program for radiacive decay(half life and full life)
31	IV	Standard software packages: MS-word its features, mail-merge, macros, formatting & table handling, header and footer
32	IV	MS-Excel: spread sheet, workbook and its contents, cell
33	IV	working with formulas, sorting, freeze panes and filters
34	IV	Insert charts in MS-Excel: Pie, Bar, column
35	IV	Introduction of MS-Power point and its features,
36	IV	components of power point: slide, Handouts, Speakers note and outline view
37	IV	Custom animation, setup show and its options, slide transition
38	IV	Different views of power point presentation
39	V	Introduction of Internet, its advantages and disadvantages
40	V	Search engines and its types and list of different search engines for chemist
41	V	Types of files: PDF, JPG, JPEG, Bitmap,. DOCX, .XLSX

Maharaja Ranjit Singh College of Professional Sciences, Indore

Department of Chemical Sciences

Lesson Plan - M. Sc. II Sem. (**Jan 2021 - June 2021**)

Subject - Organic Chemistry Practical

Teacher - Dr. Lal Kumar

Day/Lecture	Unit	Topic
1	I	To prepare and submit 9,10-dihydroanthracene-ando-alpha,beta-succinic anhydrides
2	I	To prepare and submit phenylazo-beta-naphthol coupling reaction
3	I	To prepare and submit phenolphthalene
4	I	To prepare and submit flouresencein dyes
5	I	to estimate hydroxy group of phenol from bromate-bromite method
6	I	to determine the Sponification value of an unknown oil or fat
7	I	to prepare and submit Benzyl alcohol and Benzoic acid
8	I	To determine acid value of unknown oil and fat by titration method

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Maharaja Ranjit Singh College of Professional Sciences, Indore

Department of Chemical Sciences

Lesson Plan - M. Sc. II Sem. (**Jan 2021 - June 2021**)

Subject - Inorganic Chemistry Practical

Teacher - Prof. Seema Shintre

Day/Lecture	Unit	Topic
		Chromatography
1		Seperation, identification and determination of cations by column chromatography
2		Seperation, identification and determination of anions by column chromatography
		Preparations: To prepare the following
3		$K_3[Cr(SCN)_6].4H_2O$
4		$[Co(NH_3)_4(NO_2)_2]Cl$
5		$[Co(NH_3)_5Cl]Cl_2$
6		$Ni(dmg)_2$
7		$[Co(py)_2Cl_2]$
8		$[Cu.3[CS(NH_2)]_2SO_4.2H_2O$
9		$Na_3[Co(NO_2)_6]$

Maharaja Ranjit Singh College of Professional Sciences, Indore

Department of Chemical Sciences

Lesson Plan - M. Sc. II Sem. (**Jan 2021 - June 2021**)

Subject - Physical Chemistry Practical

Teacher - Prof. Deepanshu Pandey

Day/Lecture	Unit	Topic
1	Sec A	**Conductometry**
2	Sec A	Determination of the velocity constant, order of the reaction and energy activation for saponification of ethyl acetate by sodium hydroxide conductometrically
3	Sec A	Determination of solubility & solubility product of sparingly soluble salts
4	Sec A	Determination of the strenght of strong & weak acid in a given mixture conductometrically.
5	Sec A	To study the effect of solvent on the conductance of AgNO3 & to determine the degree of dissociation & equilibrium constant in different solvents & test debye Huckel Onsager theory.
6	Sec A	Determine of the activity coefficient of zinc ions in the solution of 0.002M zinc sulphate using Debye Huckel's limiting law
7	Sec A	**Polarimetry**
8	Sec A	Determination of rate constant for hydrolysis/ inversion of sugar using a polarimeter.
9	Sec A	Enzyme kinetics - inversion of sucrose
10	Sec B	**Potentiometry / pH metry :**
11	Sec B	Determination of strengths of halides in a mixture potentiometrically
12	Sec B	Determination of the strenght of strong & weak acid in a given mixture by potentiometer/ pH meter
13	Sec B	Determination of temperature dependence of EMF of a cell.
14	Sec B	Determination of the formation constant of silver-ammonia complex & stochiometry of the complex potentiometer
15	Sec B	Acid- base titration in a non- aqueous media using a pH meter.
16	Sec B	**Refractometery :**
17	Sec B	Determination of refractive indices & specific refractions .
18	Sec B	Molar & atomic refractivities
19	Sec B	composition of a mixture of liquids
20	Sec B	Concentration of sugar in a soluiton & polarizabilities of liquids.