RPS Degree College, Balana (Mahendergarh)

Lesson Plan

2020-21(Odd Semester)

Class and Section: M.Sc Chemistry 3rd Sem
Subject: Organic Spectra (CHE-301)
Name of the Faculty : Mr. Hitesh Gupta

Lecture	Topics
1	Ultraviolet and Visible Spectroscopy:Various electronic transitions
2	Beer-Lambert law, effect of solvent on electronic transitions
3	ultraviolet bands for carbonyl compounds, unsaturated carbonyl compounds, dienes, conjugated polyenes
4	Fieser-Woodward rules for conjugated dienes and carbonyl compounds
5	Fieser-Woodward rules for conjugated dienes and carbonyl compounds
6	Fieser-Woodward rules for conjugated dienes and carbonyl compounds
7	ultraviolet spectra of aromatic and heterocyclic compounds
8	Steric effect in biphenyls
9	Infrared Spectroscopy: Instrumentation and sample handling
10	. Characteristic vibrational frequencies of alkanes, alkenes, alkynes, aromatic compounds, alcohols, ethers, phenols and amines
11	Detailed study of vibrational frequencies of carbonyl compounds
12	Effect of hydrogen bonding and solvent effect on vibrational frequencies
13	overtones, combination bands and Fermi resonance
14	FT IR, IR of gaseous, solids and polymeric materials.
15	Class Test of Unit-1
16	Nuclear Magnetic Resonance Spectroscopy: General introduction and definition

17	chemic al shift, spin- spin interaction,
18	shielding mechanism, mechanism of measurement
19	chemical shift values and correlation forprotons bonded to carbon
20	complex spin-spin interaction between two, three, four and five nuclei (first order spectra),
21	spin system-Pople notation, virtual coupling
22	. Stereochemistry, concept of topicity
23	effect of enantiomeric and diastereomeric protons
24	hindered rotation, Karplus curve -variation of coupling constant with dihedral angle.
25	hindered rotation, Karplus curve -variation of coupling constant with dihedral angle.
26	Fourier transform technique
27	Resonance of other nuclei -F, P. Further tools for simplification (chemical and instrumental) to elucidate structures by NMR
28	. Deuteration, changing solvents, trifluoroacetylation
29	basification and acidification
30	shift reagents, spin decoupling
31	Class Test of Unit-2
32	Mass Spectrometry: Introduction
33	ion product ion - EI, CI, FD and FAB,
34	ion product ion - EI, CI, FD and FAB,
35	factors affecting fragmentation

36	ion analysis, ion abundance
37	Mass spectral fragmentation of organic compounds, common functional groups, molecular ion peak
38	Mass spectral fragmentation of organic compounds, common functional groups, molecular ion peak
39	metastable peak, Nitrogen rule, molecular weight determination molecular
40	formula from isotopic ratio data
41	isotope profile of halogen compounds, factors affecting reaction pathways,
42	fragmentation pattern - simple cleavage, retro-Diels Alder,
43	Hydrogen transfer rearrangement like scrambling, ortho effect, McLafferty rearrangement
44	fragmentation patterns of hydrocarbons, alcohols, phenols , ethers, aldehydes, ketones
45	esters, carboxylic acids, amines, nitro, amides, nitriles
46	Carbon-13 NMR Spectroscopy: General considerations, chemical shift (aliphatic, olefinic, alkyne, aromatic, heteroaromatic and carbonyl carbon),
47	coupling constants. Nuclear Overhauser effect (NOE).
48	Revision of section 3
49	Test of Section 3
50	Problems pertaining to sections A, B and C
51	Problems pertaining to sections A, B and C
52	Problems pertaining to sections A, B and C
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RPS Degree College, Balana (Mahendergarh)

Lesson Plan

2020-21(Odd Semester)

Class and Section: M.Sc. 3rd Sem
Subject: Inorganic Spectroscopy
Name of the Faculty : Dr. Prashant Kumar

Lecture	Topics
1	Introduction to Syllabus
2	Mossbauer spectroscopy Basic principles
3	Spectral display
4	Spectral display
5	Dopplar shift and recoil Energy
6	Isomer shift and its interpretation
7	Isomer shift and its interpretation
8	Quadrupole interactions
9	Quadrupole interactions
10	Quadrupole interactions
11	Effect of magnetic field on mossbauer spectra
12	Application to metal complexes
13	Metal caqrbonyl, Fe-S clusters
14	M.B. spectra of Tin compound
15	Partial quadrupole splitting and geometry of the complex
16	Presenattaion of mass spectrum, basic principle
17	Application to mass spectrometry to inorganic compound
18	Molecular weight determination
19	Evalution of heat of sublimation of high melting solids
20	ESR Basic principal,, Presenation of spectra, Hyperfine coupling
21	Hyperfine coupling in isotropic system
22	Hyperfine coupling in isotropic system
23	Factors affecting the magnitude of g
24	Factors affecting the magnitude of g
25	zero field splitting
26	zero field splitting
27	Kramers rule
28	EPR of first row transiion elelments
29	Study of electron exchange reactions
30	NQR spectroscopybasic principle
31	Quadruple moment
32	Quadruple moment
33	Quadruple moment
34	Energy lends of a quadruploar nucleus

35	Energy lends of a quadruploar nucleus
36	Effect of assymetry parameters
37	Effect of assymetry parameters
38	Effect of assymetry parameters
39	Effect of external magnetic field
40	Effect of external magnetic field
41	Selected examples of elucidation of structure of inorganic compound using NQR
42	Vibrational spectroscopy , Basic principle
43	Spectra and symmetry, Selection rule
44	Symmetry and shape of AB2,AB3,AB4,AB5,AB6 type molecules
45	Symmetry and shape of AB2,AB3,AB4,AB5,AB6 type molecules
46	Symmetry and shape of AB2,AB3,AB4,AB5,AB6 type molecules
47	Modes of bonding of ambidentate ligands
48	Modes of bonding of ambidentate ligands
49	Use tosymmetry to determine the active infrared and raman lines
50	Application of resonance raman spectroscopy

RPS Degree College, Balana (Mahendergarh)

Lesson Plan

2020-21(Odd Semester)

Class and Section: M.Sc 3rd Sem

Subject: Analytical Chemistry

Name of the Faculty : Dr. Vikas Sangwan

Lecture	Topics
1	Introduction of syllabus
2	Unit-I: Error analysis and Chromatography
3	Method of Sampling and Associated errors
4	Classification of errors, Propagation of errors
5	Treatment of error
6	Normal distribution
7	Test of Significances
8	Confidence limit
9	Revision
10	Introduction of Chromatography and its types
11	Ion exchange chromatography
12	Paper chromatography
13	Thin layer chromatography
14	Gas chromatography -theory and instrumentation
15	Applications of GC
16	Liquid -liquid partition chromatography
17	High performance liquid chromatography
18	High performance liquid chromatography
19	Reverse phase chromatography
20	Revision
21	Unit-II Atomic Absorption Spectroscopy & Flame photometry
22	Principles and Instrumentation of AAS
23	Resonance lines, natural width, doppler effect
24	Broadening due to pressure, Hollow cathode lamp
25	Application of AAS to alkali and alkaline earth metals
26	Sensitivity, detection limit, interference and its elimination
27	Theory of Flame photometry
28	Flame tempertaure, emission flame photometry
29	Intensity of spectral lines
30	Selection of optimum working conditions
31	Application of flame photometry in metal analysis
32	Revision
33	Unit-III Thermal analysis
34	Introduction of TGA and DTG

35	Static and dynamic thermogravimetry
36	Instrumentation, theromgram and factors affecting therogram
37	Applications of thermogravimetry
38	Reaction Kinestics by single and multiple heating rates
39	DTA theories and curves
40	Factors affecting DTA curves
41	Instrumentation of DTA, correlation of DTA and TGA data with examples
42	DSC-Introduction and Instrumentation
43	Power compensated DSC, Heat flux DSC
44	DSC curves and factors affecting DSC curves and its applications
45	Revision
46	Unit-IV Electrogravimetry
47	Current-voltage relatioship during electrolysis
48	Decomposition potential, constant current electrolysis
49	Constant cathode potential elctrolysis, apparatus, e;ectrodes
50	Mercury cathode, applications, physical properties
51	Chemical factors of inportance in electrodeposition
52	Coulometric analysis
53	Constant electrode potential
54	Coulometric titrations and apparatus
55	Applications
56	Amperometric titrations
57	Anodic striping voltammetry
58	Cyclic voltammetry
59	Cyclic voltammetry
60	Revision

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Lesson Plan

2020-21(Odd Semester)

Class and Section: M.SC Final inorganic (3rd Sem.)
Subject: Nuclear Chemistry
Name of the Faculty : Prof. Bharat Singh

Lecture	Topics
1	Nuclear structure and nuclear stability
2	Mass and nuclear stability
3	Liquid drop model
4	Fremi gas model
5	Optical model
6	Shell model
7	Electric and magnetic moment
8	Ionisation chamber
9	GM counter
10	IDA
11	Scintillation counter
12	Solid state detector
13	Proportional counter
14	NAA
15	IDA
16	Application and limitation of radiometric titration
17	Photoelectric effect
18	Compton effect
19	Pairproduction
20	Radiolysis of water
21	Probing by isotopes
22	Prepration of readioisotopes
23	Szilard chamler
24	Concept of tracer
25	Chemical yield
26	Radiochemical purity
27	Uses of nuclear radiation
28	Alpha and beta decay
29	Gamma decay and k electron capture
30	Nuclear reaction
31	Energetic and cross section
32	Accelerator
33	Cyclotron
34	Angular momentum

35	Compound nuclear model
36	NUClear fission
37	Nuclear fusion
38	Artificial activty
39	Nuclear reactor
40	Gas filled counter

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Lesson Plan

2020-21(Odd Semester)

Class and Section: M.Sc 3rd Sem IOC
Subject: Inorganic Chemistry specialisation (CHE 305)
Name of the Faculty : Anmol Yadav

Lecture	Topics
1	Metal Ions in Biological Systems
2	Fundamentals of inorganic biochemistry
3	essential, non-essential and trace elements in bio-systems,
4	essential, non-essential and trace elements in bio-systems,
5	essential, non-essential and trace elements in bio-systems,
6	Role of alkali/alkaline earth metals in bio-system
7	Role of alkali/alkaline earth metals in bio-system
8	Bioinorganic chemistry of Na+ , K+ , Mg2+ and Ca2+
9	Bioinorganic chemistry of Na+ , K+ , Mg2+ and Ca2+
10	Bioinorganic chemistry of Na+ , K+ , Mg2+ and Ca2+
11	Bioinorganic chemistry of Na+ , K+ , Mg2+ and Ca2+
12	Ionophores
13	active transport of cations across membranes
14	sodium pump
15	Calcium pump
16	Calcium carriers
17	Biochemistry of calcium as hormonal messenger
18	muscle contraction
19	blood clotting
20	neurotransmitter
21	Role of metal ions in replication and transcription process of nucleic acids
22	metal ions in nucleotide systems
23	effect of metal ions on nucleic acids
24	Metal complexes of polynucleotides, nucleosides and nucleic acids (DNA & RNA)
25	Metal complexes of polynucleotides, nucleosides and nucleic acids (DNA & RNA)
26	Template temperature
27	stability of DNA.
28	Role of metal ions in oxygen carriers
29	Porphyrins
30	metalloporphyrins
31	Hemoproteins
32	structure and functions of hemoglobin and myoglobin
33	structure and functions of hemoglobin and myoglobin

34	synthetic oxygen carrier model systems
35	Fixation of dinitrogen biologically and abiologically
36	biotransformation of non-metallic inorganic compounds
37	Nitrogenase
38	model for nitrogenase
39	metal-N2 complexes
40	photosynthesis
41	chlorophyll
42	Ferritin
43	transferrin
44	siderophores
45	Metal ions as antioxidants
46	metal ion enhancing catalytic activity of enzymes (Biocatalysts)
47	Inhibitions as competitive and non-competitive
48	Carboxypeptidase
49	Carbonic anhydrase
50	alkaline phosphatase
51	alcohol dehydrogenase
52	Catalase
53	Peroxidase
54	Cytochrome P- 450
55	Superoxide dismutase
56	blue copper electron transfer enzyme
57	Xanthine oxidase
58	Xanthine oxidase
59	Vitamin B12
60	Vitamin B6

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Lesson Plan

2020-21(Odd Semester)

Class and Section: M.Sc. 3rd Sem Organic Chemistry
Subject: Pericyclic and photo Chemistry
Name of the Faculty : Mr. Narender Saini

Lecture	Topics
1	Concerted Reactions-I: Molecular orbital symmetry, frontier orbital of ethylene, 1,3-butadiene,
2	1,3,5 - hexatriene and allyl system classification of pericyclic reactions, Woodward -Hoffmann correlation diagram.
3	FMO & PMO approach.
4	Electrocyclic reaction - conrotatory and disrotatory motions.
5	4n, 4n+2, allyl systems,
6	Ring opening of cyclopropyl halides and tosylates.
7	Cycloaddition-antarafacial and suprafacial additions, 4n, 4n+2 systems,
8	, 2+2 addition of ketenes, isocyanates,
9	1,3-dipolar cycloaddition and cheleotropic reactions.
10	Class Test section A
11	Concerted Reaction-II: Cycloadditions-antarafacial and suprafacial additions,
12	4n and 4n+2 systems, 2+2 addition of ketenes
13	isocyanates, 1,3 -dipolar cycloadditions
14	Cheleotropic Reactions.
15	Sigmatropic Rearrangements,
16	, suprafacial and antarafacial shifts of H, sigmatropic shifts involving carbon moietie
17	retention and inversion of configuration, [3,3] and [5,5] sigmatropic rearrangements,
18	detailed treatment of Sommelet -Hauser,
19	Claisen and Cope rearrangements.
20	Introduction to ene reactions.
21	Class Test section B
22	Green Chemistry-I: Principle of Green chemistry and its applications:
23	Basic Principle and need of green chemistry, Different tools for green synthesis
24	Elementary idea of green reagent, green solvent, green catalyst, solid phase, greener source of energy) atom economy,
25	Role of biocatalysts in green synthesis – enzyme catalyzed oxidation, reduction and hydrolytic reaction
26	synthesis involving basic principle of green chemistry-synthesis of adipic acid
27	BHC synthesis of Ibuprofen.
28	Principles of ultrasound and microwave assisted organic synthesis
29	Reactions in ionic liquids.

30	Class Test section C
31	Green Chemistry-II: Photochemistry of carbonyl compounds
32	Norrish type I and type II changes,
33	photoreaction of cyclic ketones,
34	Paterno-Buchi reaction and Photoreduction. Photochemistry of olefins and 1,6-Butadiene
35	cis-trans isomerisation, dimerisation and cycloadditions
36	methane rearrangement, enone and dienone rearrangements
37	enone and dienone rearrangements,
38	photochemistry of aromatic compounds (substitution, isomerization,
39	cyclization and cycloaddition reactions), Photo-Fries rearrangement,
40	photolysis of nitrile esters and Barton reaction, Hoffman-Loeflller-Freytag reaction.

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Lesson Plan

2020-21(Odd Semester)

Class and Section: M.Sc. 3rd Sem Organic Chemistry
Subject: Reagents for organic synthesis
Name of the Faculty : Ms Renu Sharma

Lecture	Topics
1	Introduction to organic reagents
2	Grignard reagent, properties and chemical reactions
3	Organolithium compounds
4	organo lithium cuprates
5	organozinc compounds
6	organo copper compounds
7	organoboranes
8	organocadmium compounds
9	organosilicon compounds
10	organosulphur compounds
11	organoiodines
12	organo cobalt compounds
13	organochromium compounds
14	tebbe olefination
15	organoiron compounds
16	organonickel compounds
17	organo palladium compounds
18	sunzuki coupling
19	Negishi coupling
20	Buchwald Hartwig coupling
21	Sonogashira coupling
22	Ullman coupling,heck coupling
23	Stille coupling
24	Grubbs catalyst-First generation and second generation catalyst
25	Nozaki Hiyama coupling
26	Orthometallation
27	Reduction of alkanes
28	Reduction of alkenes
29	Reduction of aromatic hydrocarbons
30	Reduction of nitro,azo compounds
31	Reduction of oximes
32	Reduction of nitroso compounds
33	Reduction of alcohols
34	reduction of carbonyl compounds
35	oxidation of alkanes, alkenes,alkynes
36	oxidation of alcohols,
37	oxidation of carbonyl compounds

38	oxidation of carboxylic acids
39	oxidation of nitrogen containg functional groups
40	oxidation of sulphur containg groups
41	Oxidation with ruthenium tetra oxide
42	oxidation by using thallium nitrate

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Lesson Plan

2020-21(Odd Semester)

Class and Section: M.Sc Physical Special 3rd sem
Subject: Advanced Electrochemistry
Name of the Faculty : Ms. Vandana

Lecture	Topics
1	introduction of chemical electrodics
2	basics of electrochemistry
3	consequences of charge transfer at electrode surface
4	rate of charge transfer reaction under zero field
5	rate of charge transfer reaction under influence of an electric field
6	continued
7	equilibrium exchange current density
8	nonequilibrium drift current density
9	non-equilibrium drift current density
10	Butler volmer equation
11	general and special cases of Butler volmer equation
12	special cases of Butler volmer equation
13	high field and low field approximation
14	physical meaning of symmetry factor
15	a preliminary to second theory of symmetry factor
16	a simple picture of symmetry factor
17	dependence of symmetry factor on overpotential
18	polarisable and non polarisable interfaces
19	overpotential
20	exchange current density
21	Butler volmer equation
22	polarisable and non polarisable interface
23	tafel equation
24	tafel equation
25	difference between Kinetic Lee and mass transport controlled electrochemical processes
26	continued
27	continued
28	difference between single step and multiple step electrode reactions
29	continued
30	introduction of corrosion and forms of corrosion
31	uniform corrosion and Galvanic corrosion
32	pitting corrosion and crevice corrosion
33	intergranular corrosion

34	stress corrosion cracking
35	corrosion difatigue
36	fretting corrosion and dealloying
37	hydrogen embrittlement and erosion corrosion
38	microbial induced corrosion and filiform corrosion
39	exfoliation
40	fundamentals of electrolytic corrosion theory and Kinetics
41	continued
42	corrosion prevention
43	batteries fuel cells
44	electrocatalysis
45	introduction in and application of chronoamperometry
46	cyclic voltammetry
47	chronopotentiometry
48	coulometry
49	AC impedance spectra electrochemistry
50	hydrodynamic methods
51	fuel cells introduction
52	hydrogen oxygen fuel cell and hydrocarbon air fuel cell
53	natural gas and CO- air fuel cell
54	important quantities in electricity storage such as energy density and power density
55	desirable conditions for an ideal energy storage device
56	storage of electricity using lead acid battery
57	dry cell
58	silver zinc cell
59	sodium sulphur cell
60	conclusion of batteries and fuel cells