D.B.F. Dayanand College of Arts and Science, Solapur

COURSE OUTCOME

Name of Department: Chemistry

D.B.F. Dayanand College of Arts and Science, Solapur

COURSE OUTCOME

Name of Department: Chemistry

B.Sc. III		
NAME OF SUBJECT: Physical Chemistry		
SEM V		
COURSE NUMBER (PAPER NUMBER) P-IX		
TITLE OF COURSE (NAME OF PAPER): Analytical and Industrial Physical Chemistry		
COURSE CONTENT	**OBJECTIVES**	**OUTCOME**
Phase Equilibri 1.1 Introduction 1.2 Gibbs phase rule : Phase rule equation and explanation of terms involved in the equation. 1.3 Phase diagram, true and metastable equilibria. 1.4 One component systems : (i) Water system (ii) Sulphur system with explanation for polymorphism. 1.5 Two component systems : (i) Eutectic system : (Ag - Pb system); Desilverisation of lead, (ii) Formation of compound with congruent melting point ($FeCl_3$ - H_2O)a	To understand the basic knowledge about homogeneous ,heterogeneous reactions, Gibbs' phase rule one and two components systems	Student should able to apply the phase rule to various systems and should explain.
. **Photochemistry. [12]** 3.1 Introduction 3.2 Difference between thermal and photochemical processes. 3.3 Laws of photochemistry : Grotthus - Draper law,	To understand the basic knowledge about Difference between thermal and photochemical processes. 3.3 Laws of photochemistry : Grotthus - Draper law, Lambert law, Lambert - Beer's law (with derivation), Stark -	i)At the end of the course, the student will be able to explain basic concept of Quantum yield, Photosensitized reactions, Jablonski diagram ii)Student should understand the basic concepts and satisfied. Solve the problems.

Lambert law, Lambert - Beer's law (with derivation), Stark - Einstein law. 3.4 Quantum yield, Reasons for high quantum yield (e.g. H_2 - Cl_2) and low quantum yield. (e.g. Decomposition of HI and HBr). 3.5 Photosensitized reactions - Dissociation of H_2, Photosynthesis. 3.6 Photodimerisation of anthracene. 3.7 Jablonski diagram depicting various processes occurring in the excited state : Qualitative description of fluorescence and phosphorescence. 3.8 Chemiluminescence. 3.9 Numerical problems. ***Reference Books:***	Einstein law. 3.4 Quantum yield, Reasons for high quantum yield (e.g. H_2 - Cl_2) and low quantum yield. 5 Photosensitized reactions - Dissociation of H_2, Photosynthesis. 3.6 Photodimerisation of anthracene. 3.7 Jablonski diagram depicting various processes occurring in the excited state : Qualitative description of fluorescence and phosphorescence. 3.8 Chemiluminescence. 3.9 Numerical problems.	

Electro chemistry 2.1 Introduction 2.2 Thermodynamics of electrode potentials, Nernst equation for electrode and cell potentials in terms of activities. 2.3 Types of electrodes : Description in terms of construction, representation, half cell reaction and emf equation for, i) Metal - metal ion electrode. ii) Amalgam electrode. iii) Metal - insoluble salt electrode. iv) Gas - electrode. v) Oxidation - Reduction electrode. 2.4 i) Reversible and Irreversible cells. ii) Chemical cells without transference. iii) Concentration cells a. Electrode concentration cell I) Reversible to cation II) Reversible to anion	**To know the basic concept of** 2.1 Introduction 2.2 Thermodynamics of electrode potentials, Nernst equation for electrode and cell potentials in terms of activities. 2.3 Types of electrodes : Description in terms of construction, representation, half cell reaction and emf equation for, i) Metal - metal ion electrode. ii) Amalgam electrode. iii) Metal - insoluble salt electrode. iv) Gas - electrode. v) Oxidation - Reduction electrode. 2.4 i) Reversible and Irreversible cells. ii) Chemical cells without transference. iii) Concentration cells a. Electrode concentration cell I) Reversible to cation II) Reversible to anion b. Electrolyte concentration cells without transference	**Students will gain** basic concept of 2. 2.2 Thermodynam Nernst equation fo cell potentials in te 2.3 Types of electr construction, repre reaction and emf e i) Metal - metal ion electrode. iii) Metal - insolub electrode. v) Oxidation - Red 2.4 i) Reversible a ii) Chemical cells iii) Concentration a. Electrode concer I) Reversible to ca II) Reversible to a b. Electrolyte conc transference

b. Electrolyte concentration cells without transference 2.5 Equilibrium constant from cell emf, Determination of the thermodynamic parameters such as ΔG, ΔH and ΔS. 2.6 Applications of emf measurements : i) Determination of pH of solution using Hydrogen electrode. ii) Solubility and solubility product of sparingly soluble salts (based on concentration cell). 2.7 Numerical problems.	2.5 Equilibrium constant from cell emf, Determination of the thermodynamic parameters such as ΔG, ΔH and ΔS. 2.6 Applications of emf measurements : i) Determination of pH of solution using Hydrogen electrode. ii) Solubility and solubility product of sparingly soluble salts (based on concentration cell). 2.7 Numerical problems.	2.5 Equilibrium co Determination of t such as ΔG, ΔH an 2.6 Applications o i) Determination o electrode. ii) Solubility and s soluble salts (based 2.7 Numerical prob

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B.A. / B.Sc. / M.A. / M.Sc.	: **B.Sc. III**
NAME OF SUBJECT	: Inorganic Chemistry
SEM I / II / III / IV / V / VI	: Sem. V
COURSE NUMBER (PAPER NUMBER)	: **X**
TITLE OF COURSE (NAME OF PAPER)	**: Inorganic Chemistry**

COURSE CONTENT	OBJECTIVES	OUTCOME
Metal Ligand Bonding in Transition Metal Complexes : A) **Crystal Field Theory (CFT).** 1.A.1) Introduction - What is CFT? 1.A.2) Basic concept of CFT. 1.A.3) Formation of complexes with Crystal field splitting of 'd' orbitals i. Shapes of d orbitals and their electron density region ii. Formation of octahedral Complex with Crystal field splitting of 'd' orbitals, e.g. High spin and low spin octahedral complexes of Co(III): $[CoF6]^{3-}$, $[Co(NH_3)_6]^{3+}$. iii. Formation of tetrahedral Complex with Crystal field splitting of 'd' orbitals, e.g. $[CoCl_4]^{2-}$ iv. Formation of square planer Complex with Crystal field splitting of 'd' orbitals e.g. $[Co(CN)_4]^{2-}$ 1.A.4. Jahn - Tellar distortion. 1.A.5. Factors affecting the Crystal - field splitting. 1.A.6. Crystal field stabilization energy (Δ): Calculation for octahedral complexes only. 1.A.7. Applications and limitations of CFT. **B) Molecular Orbital Theory (MOT).** 1.B.1. Introduction. 1.B.2. Basic concept 1.B.3. Symmetry classes of atomic orbitals 1.B.4. Formation of octahedral complex a) Assumptions b) M.O. energy level diagram for hypothetical octahedral complex. 1.B.5. Examples: octahedral complexes with sigma bonding only such as- e.g.$[Ti(H_2O)_6]^{3+}$,	1. Enable students to understand various theories of metal ligand bonding in transition metal complex 2. To help the students to understand crystal field theory , concept of CFT, shapes of d-orbital, formation of complexes – octahedral complex and square planar complexes 3. To help the students to understand Molecular orbital theory , concept, formation of octahedral complex	1. Students understood nature of metal ligand bonding in metal complexes and the characteristics of coordinate compounds on the basis of CFT and MOT.

$[FeF_6]^{3-}$, $[Fe(CN)_6]^{3-}$, $[CoF_6]^{3-}$, $[Co(NH_3)_6]^{3+}$, $[Ni(NH_3)_6]^{2+}$ 1.B.6. Applications and limitations of MOT. 1.B.7. Comparison between CFT and MOT.		
Nuclear Chemistry: 2.1. Nuclear reaction and energetics of nuclear reactions. 2.2. Classification of nuclear reactions and Types of nuclear reactions: i) Artificial transmutation. ii) Artificial radioactivity. iii) Projectile capture reaction. iv) Projectile capture - particle emission reaction. v) Nuclear fission. vi) Nuclear fusion. 2.3. Use of Uranium, Thorium and Plutonium for: a. Nuclear reactor b. Atomic Bomb. 2.4. Applications of radioisotopes as tracers. i) Chemical investigation - Esterification. ii) Structural determination - Phosphorus pentachloride. iii) Analytical Chemistry - isotopic dilution method for determination of volume of blood. iv) Age determination - Dating by ^{14}C.	1. To help the students to understand nuclear reactions 2. To help the students to understand difference between chemical reactions and nuclear reactions 3. To help the students to understand various types of nuclear reactions 4. To help the students to understand applications of nuclear reactions in energy production 5. To help the students to understand applications of radioactivity in various fields	1. Students understood nuclear reactions, difference between chemical and nuclear reactions 2. Students understood various types of chemical reactions and their beneficial characteristic 3. Students understood application of nuclear reactions 4. Students can apply radioactive techniques in various fields
Bioinorganic Chemistry: 3.1. Essential and trace elements in biological process. i) Essential elements a) Macro / major elements b) Micro/trace/minor elements ii) Non-essential elements 3.2. Metalloporphyrins with special reference to haemoglobin and myoglobin. i) Structure of	1. Enable students to understand requirement of essential and trace elements in biological processes as major and minor element 2. Enable students to understand structure of hemoglobin myoglobin, function of hemoglobin, myoglobin 3. Help the students to	1. Students understood role of essential and trace elements in biological process 2. Students understood structure of hemoglobin and myoglobin 3. Students understood role of alkali and alkaline earth metal ions

Haemoglobin(Hb) ii) Structure of Myoglobin (Mb) iii) Function of Haemoglobin (Hb) and Myoglobin (Mb) as Oxygen transport from lungs to tissues iv) Function of Haemoglobin as Carry back CO_2 to lungs v) Co-operativity vi) Oxygen binding curve vii) Difference between Haemoglobin (Hb) and Myoglobin (Mb) 3.3. Role of alkali and alkaline earth metal ions with special reference to Na^+ , K^+ and $Ca^{2+.}$ i) Role of Na^+ and K^+ ii) Role of Ca^{2+} .	understand role of alkali and alkaline earth metal	
Catalysis 4.1. Introduction 4.2. Classification of catalytic reactions : Homogeneous & Heterogeneous 4.3. Types of catalysis 4.4. Characteristics of catalytic reactions 4.5. Mechanism of catalysis : i) Intermediate compound theory ii) Adsorption theory. 4.6. Industrial Applications of Catalysis.	1. To help the students to understand about catalyst 2. Enable students to understand various types of catalytic reactions 3. To help the students to understand various types of catalysis 4. To help the students to understand mechanism of catalysis 5. Enable students to understand various industrial applications of catalyst	1. Students are able to understand about catalyst 2. Students are able to understand various types of catalytic reactions 3. Students are able to understand various types of mechanism of catalysis 4. Students are able to apply catalyst in various field and various branches of chemistry and other field
Fertilizers 5.1. Nutrient Functions in plant growth : Nitrogen, Phosphorous, Potassium, Calcium, Magnesium, Sulphur, Boron, Iron, Zinc, Manganese, Copper, Molybdenum, Chlorine, Role of these nutrients as : Functions, Excess supply and Deficiency. 5.2. Definition and qualities of an ideal fertilizers: 5.3. Classification or types	1. Enable students to understand various nutrient required for plant growth 2. Enable students to understand definition, qualities of fertilizer 3. To help the students to understand manufacturing process of various fertilizer	1. Students understood various plant nutrient 2. Students understood definition, qualities of various fertilizer 3. Students can apply these manufacturing process in analytical chemistry

of fertilizers: 5.4. Manufacture of fertilizers, eg. Urea, Ammonium sulphate, Superphosphate, Triple superphosphate, Ammonium phosphate. 5.5. Mixed fertilizers, Compound or complex fertilizers. 5.6. Pollution caused by fertilizers:		

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B.Sc. III		
NAME OF SUBJECT: Organic Chemistry		
SEM : V		
COURSE NUMBER (PAPER NUMBER): P- XI		
TITLE OF COURSE (NAME OF PAPER): OrganicChemistry		
COURSE CONTENT	**OBJECTIVES**	
1 Spectroscopic Method. [20] **1.1. Infrared Spectroscopy :** 1.1.1 Introduction, 1.1.2 Principle of IR spectroscopy, 1.1.3 Double beam IR spectrophotometer-Schematic diagram. 1.1.4 Fundamental modes of vibration, 1.1.5 Types of vibration 1.1.6 Hooke's law, 1.1.7 factors affecting values of vibrational frequencies, 1.1.8 conditions for absorption of radiation and selection rule, 1.1.9 fundamental group regions of IR spectrum, 1.1.10 Functional group region, Finger print region, 1.1.11 characteristic absorption of various functional groups, 1.1.12 Applications of IR spectroscopy – Determination of structure, Identification of	**To study the:** 1.1.2 Principle of IR spectroscopy, 1.1.3 Double beam IR spectrophotometer-Schematic diagram. 1.1.4 Fundamental modes of vibration, 1.1.5 Types of vibration 1.1.6 Hooke's law, 1.1.7 factors affecting values of vibrational frequencies, 1.1.8 conditions for absorption of radiation and selection rule, 1.1.9 fundamental group regions of IR spectrum, 1.1.10 Functional group region, Finger print region, 1.1.11 characteristic absorption of various functional groups, 1.1.12 Applications of IR spectroscopy – Determination of structure, Identification of functional groups spectral problems based on IR	**Students gain** t All spectroscop factors on IR ar Applications of Determination o functional grou IR **Students gain** t Theory of PMR Shielding and d Chemical shift, by delta scale a TMS as referen Peak area (integ Spin - spin split Definition of co **Students are a** Problems pertai of simple organ PMR spectrosc

functional groups spectral problems based on IR **1.2 NMR Spectroscopy**. 1.2.1 Introduction 1.2.2. Proton magnetic resonance (1H) spectroscopy (PMR). 1.2.3 Principles of PMR spectroscopy. 1.2.4 Magnetic and non-magnetic nuclei. 1.2.5. Theory of PMR spectroscopy - spinning nuclei, magnetic moment and magnetic field, processional motion of nuclei without mathematical details, nuclear resonance. 1.2.6 NMR - Instrument. Schematic diagram. 1.2.7. Shielding and deshielding. 1.2.8. Chemical shift, measurement of chemical shift, by delta scale and tau scale. 1.2.9. TMS as reference. Advantages of TMS. 1.2.10. Peak area (integration) 1.2.11. Spin - spin splitting (n + 1 rule). 1.2.12. Definition of coupling constant (J value) of first order coupling. 1.2.13. PMR spectra of ethanol, ethyl bromide, acetaldehyde, 1, 1, 2 - tribromoethane, ethyl acetate, acetophenone ,benzaldehyde, propanoic acid and benzoic acid 1.2.14. Problems pertaining to the structure elucidation of simple organic compounds using PMR spectroscopic data (supporting IR and UV data to be given).	**To solve** 1.6 Spectral problems based on IR. **1.2 NMR Spectroscopy** 1.2.2. Proton magnetic resonance (1H) spectroscopy (PMR). 1.2.3 Principles of PMR spectroscopy. 1.2.4 Magnetic and non-magnetic nuclei. 1.2.5. Theory of PMR spectroscopy - spinning nuclei, magnetic moment and magnetic field, processional motion of nuclei without mathematical details, nuclear resonance. 1.2.6 NMR - Instrument. Schematic diagram. 1.2.7. Shielding and deshielding. 1.2.8. Chemical shift, measurement of chemical shift, by delta scale and tau scale. 1.2.9. TMS as reference. Advantages of TMS. 1.2.10. Peak area (integration) 1.2.11. Spin - spin splitting (n + 1 rule). 1.2.12. Definition of coupling constant (J value) of first order coupling. 1.2.13. PMR spectra of ethanol, ethyl bromide, acetaldehyde, 1, 1, 2 tribromoethane, ethyl acetate, acetophenone ,benzaldehyde, propanoic acid and benzoic acid 1.2.14. Problems pertaining to the structure elucidation of simple organic compounds using PMR spectroscopic data (supporting IR and UV data to be given).	UV data to be g
1.3 Mass spectroscopy. 1.3.1 Introduction. 1.3.2 Theory of mass spectroscopy 1.3.3 Mass spectrometer - schematic diagram 1.3.4 Formation of ions by ionization 1.3.5 Types of ions with examples. 1.3.6. Applications of mass spectroscopy. i) Determination of molecular weight. ii) Determination of molecular formula.	To study, Introduction and Theory of mass spectroscopy, Instrumentation of Mass spectrometer, Formation of ions, Types of ions, Applications of mass spectroscopy	Student got und Mass spectrosc Instrumentation Ion formation, Types of ions, Applications
2. Stereochemistry	•To understand the concept of stereochemistry	• Students able t

A) Introduction. B) Baeyer's strain theory. C) Theory of strainless rings. D) Conformation and stability of cyclohexane and monosubstitutedcyclohexanes – methyl cyclohexane. E) Locking of conformation in t-butyl cyclohexane. F) Stereoselective and stereospecific reactions : i) Stereochemistry of addition of halogens to alkenes:syn and anti addition. Example - Addition of bromine to 2-butene. (mechanism not expected) ii) Alkaline hydrolysis of 2-chlorobutane to 2-butanol(Example of SN^2 reaction)	•How calculate the angle and stability of cyclic compounds by Baeyer theory. •Effect of large groups in cyclic compounds. •Using stereochemistry, stereoselective and stereospecific reactions and stereochemical different products formation with different examples.	various types of • Students know and why there is energy (more sta • Students unde compound with compounds. • Students unde stereoselective a what is meaning products.
3. Name reactions. Mechanism and applications of following reactions : 3.1 Stobbe condensation. 3.2 Oppenauer oxidation. 3.3 MeerweinPonndorfVerley reduction. 3.4 Reformatsky reaction. 3.5 Wagner - Meerwein Rearrangement. 3.6 Hofmann rearrangement reaction. 3.7 Wittig reaction. 3.8 Related problems.	To study, Mechanism and applications of following reactions : Stobbe condensation. Oppenauer oxidation. MeerweinPonndorfVerley reduction. Reformatsky reaction. Wagner - Meerwein Rearrangement. Hofmann rearrangement reaction. Wittig reaction. Related problems.	**Students gain** i Mechanism and following react Stobbe condens Oppenauer oxi MeerweinPonn Reformatsky re Wagner - Meer Hofmann rearra Wittig reaction. Related problem
4. Organic synthesis via Enolates 4.1 Introduction - Reactive methylene group. 4.2 Ethyl acetoacetate - synthesis by Claisen	**To study** 4.1 Introduction - Reactive methylene group.	**Students gain** i Basic terms inv Types and subt

condensation, acidity of methylene hydrogen (salt formation), Keto-enol tautomerism, synthetic applications - Synthesis of alkyl and dialkyl derivatives, monobasic, dibasic and α- β- unsaturated acid, heterocyclic compound. 4.3 Diethyl malonate - Synthesis, acidity of methylene hydrogen (salt formation). Synthetic applications - Synthesis of alkyl and dialkyl derivatives, monobasic , dibasic acid, α- β- unsaturated acid, α-amino acid and heterocyclic compound.	4.2 Ethyl acetoacetate - synthesis by Claisen condensation, acidity of methylene hydrogen (salt formation), Keto-enol tautomerism, synthetic applications - Synthesis of alkyl and dialkyl derivatives, monobasic, dibasic and α- β- unsaturated acid, heterocyclic compound. 4.3 Diethyl malonate - Synthesis, acidity of methylene hydrogen (salt formation). Synthetic applications - Synthesis of alkyl and dialkyl derivatives, monobasic , dibasic acid, α- β- unsaturated acid, α-amino acid and heterocyclic compound.	intermediates in - To study the Ethyl acetoace condensation, a hydrogen (salt Also study of c organic synthes

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B.Sc. III		
NAME OF SUBJECT: Physical Chemistry		
SEM V		
COURSE NUMBER (PAPER NUMBER) P-XII		
TITLE OF COURSE (NAME OF PAPER): Analytical and Industrial Physical Chemistry		
COURSE CONTENT	**OBJECTIVES**	**OUTCOME**
Potentiometry: 1) Introduction. 2) Detail study of calomel, quinhydrone and glass electrodes and their use in determination of ph 3) Potentiometric titrations: Classical and Analytical methods for locating end points. I)Acid –Base titrations. II)Redox Titrations. III)Precipitation titrations. 4) Advantages of Potentiometric titrations	Detail study of calomel, quinhydrone and glass electrodes and their use in determination of ph Potentiometric titrations: Classical and Analytical methods for locating end points. Types of potentiometric titrations Acid –Base, Redox and Precipitation titrations. Advantages of Potentiometric titrations	Student should able to know various types of electrodes as reference and indicator electrodes To study the end points of reactions by potentiometric methods

5) Basic circuit of direct reading potentiometer.		
Flame Photometry: 1) General Principles. 2) Instrumentation: Block diagram,Burners: Total consumption burner, liminor floe burner and Lundergarph burner, mirror, slits, mionchromators, filters and detectors. 3) Applications in qualitative and quntitative analysis. 4) Limitations of flame photometry	Principle Various components of flame photometry Burners: Total consumption burner, liminor floe burner and Lundergarph burner, mirror, slits, mionchromators, filters and detectors. Applications in qualitative and quntitative analysis. Limitations of flame photometry	The students can know the basic knowledge of flame photometry as analytical techniques
Electroplating 3.1 Introduction. 3.2 Electrolysis, Faraday's laws, Cathode current efficiency. 3.3 Basic principles of electroplating, cleaning of articles. 3.4 Electroplating of Nickel and Chromium. 3.5 Anodising.	**To study** 3.2 Electrolysis, Faraday's laws, Cathode current efficiency. 3.3 Basic principles of electroplating, cleaning of articles. 3.4 Electroplating of Nickel and Chromium. 3.5 Anodising.	**Student understands the concepts:** 3.2 Electrolysis, Faraday's laws, Cathode current efficiency. 3.3 Basic principles of electroplating, cleaning of articles. 3.4 Electroplating of Nickel and Chromium. 3.5 Anodising.
1. Colorimetry. 1.1 Introduction 1.2 General discussion of theory of colorimetry : Lambert law, Beer's law (Derivation not expected), Terms used in Colorimetry, Application of Beer's law, Deviation from Beer's law. 1.3 Classification of methods of 'colour' measurement or comparison, Photoelectric photometer method - single cell photo-electric colorimeter.	To make students know the information about functioning of Colorimeter,its use in measuring concentration of unknown solutions which improves their practical skills.	Students will learn functioning of Colorimeter,improving their skills in practicals by working with the machine in determining the concentration of unkown solutions.
Conductometry: 5.1 Measurement of conductance	**To study** 5.1 Measurement of conductance	**Students gain an understanding of :**

by Wheatstone bridge, Basic circuit of D.C. Wheatstone bridge, use of alternating current, conductivity water, Different types of conductivity cells, cell constant and its determination. Experimental determination of specific, equivalent and molecular conductance's. 5.2 Conductometric acid-base titrations i. Strong acid against strong base ii. Strong acid against weak base iii. Weak acid against strong base. iv. Weak acid against weak base. 5.3 Advantages of conductometric titrations	by Wheatstone bridge, Basic circuit of D.C. Wheatstone bridge, use of alternating current, conductivity water, Different types of conductivity cells, cell constant and its determination. Experimental determination of specific, equivalent and molecular conductance's. 5.2 Conductometric acid-base titrations i. Strong acid against strong base ii. Strong acid against weak base iii. Weak acid against strong base. iv. Weak acid against weak base. 5.3 Advantages of conductometric titrations	5.1 Measurement of conductance by Wheatstone bridge, Basic circuit of D.C. Wheatstone bridge, use of alternating current, conductivity water, Different types of conductivity cells, cell constant and its determination. Experimental determination of specific, equivalent and molecular conductance's. 5.2 Conductometric acid-base titrations i. Strong acid against strong base ii. Strong acid against weak base iii. Weak acid against strong base. iv. Weak acid against weak base. 5.3 Advantages of conductometric titrations

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COURSE OUTCOME

Name of Department: Chemistry

B.Sc. III		
NAME OF SUBJECT: Physical Chemistry		
SEM VI		
COURSE NUMBER (PAPER NUMBER) : P-XIII		
TITLE OF COURSE (NAME OF PAPER): Physical Chemistry		
COURSE CONTENT	**OBJECTIVES**	
Spectroscopy 1.1 Introduction 1.2 Electromagnetic radiation. 1.3 Electromagnetic spectrum, Energy level diagram. 1.4 Rotational spectra of diatomic molecules : Rigid rotor model; moment of inertia (derivation not expected); energy levels of rigid rotor, selection rule; spectral intensity; distribution using population distribution (Maxwell - Boltzman distribution), determination of bond length; isotope effect. Interaction of radiation with rotating molecule. 1.5 Vibrational spectra of diatomic molecules : Simple Harmonic oscillator model, Vibrational energies of diatomic molecules, Determination of force constant, overtones. Interaction of radiation with vibrating molecules. 1.6 Numerical problems.	**To study the:** 1.2 Electromagnetic radiation. 1.3 Electromagnetic spectrum, Energy level diagram. 1.4 Rotational spectra of diatomic molecules : Rigid rotor model; moment of inertia (derivation not expected); energy levels of rigid rotor, selection rule; spectral intensity; distribution using population distribution (Maxwell - Boltzman distribution), determination of bond length; isotope effect. Interaction of radiation with rotating molecule. 1.5 Vibrational spectra of diatomic molecules : Simple Harmonic oscillator model, Vibrational energies of diatomic molecules, Determination of force constant, overtones. Interaction of radiation with vibrating molecules. **To solve** 1.6 Numerical problems.	**Students gain the** 1.2 Electromagneti 1.3 Electromagneti diagram. 1.4 Rotational spec Rigid rotor model; not expected); ener selection rule; spec population distribu distribution), deter isotope effect. Inte rotating molecule. 1.5 Vibrational spe Simple Harmonic energies of diatom force constant, ove radiation with vibr **Students are able** 1.6 Numerical prob
Solution 2.1 Introduction 2.2 Ideal solutions, Raoult's law, vapour pressure of ideal and non ideal solutions of miscible liquids. 2.3 Vapour pressure and boiling point diagrams of miscible liquids. Type I : Systems with intermediate total vapour pressure. (i.e. System in which B.P. increases regularly - Zeotropic) Type II : Systems with a maximum in the total vapour pressure. (i.e. System with a B.P. minimum - Azeotropic)	To understand the basic concept of Normality, Molarity, Molality, Mole fraction, 2.1 Introduction 2.2 Ideal solutions, Raoult's law, vapour pressure of ideal and non ideal solutions of miscible liquids. 2.3 Vapour pressure and boiling point diagrams of miscible liquids. Type I : Systems with intermediate total vapour pressure. (i.e. System in which B.P. increases regularly - Zeotropic) Type II : Systems with a maximum in the total vapour pressure.	**Students will gain** basic concept of N Mole fraction, Rao Raoult's law 2.1 Introduction 2.2 Ideal solutions of ideal and non id liquids. 2.3 Vapour pressur miscible liquids. Type I : Systems w pressure. (i.e. System in whi Zeotropic) Type II : Systems

Type III :Systems with a minimum in the total vapour pressure. (i.e. System with a B.P. Maximum - Azeotropic) Distillation of miscible liquid pairs. 2.4 Solubility of partially miscible liquids. (i) Maximum solution temperature type : Phenol - water system. (ii) Minimum solution temperature type :Triethyl amine - water system. (iii) Maximum and minimum solution temperature type : Nicotine - water system.	(i.e. System with a B.P. minimum - Azeotropic) Type III :Systems with a minimum in the total vapour pressure. (i.e. System with a B.P. Maximum - Azeotropic) Distillation of miscible liquid pairs. 2.4 Solubility of partially miscible liquids. (i) Maximum solution temperature type : Phenol - water system. (ii) Minimum solution temperature type :Triethyl amine - water system. (iii) Maximum and minimum solution temperature type : Nicotine - water system.	vapour pressure. (i.e. System with a Type III :Systems vapour pressure. (i.e. System with a Distillation of misc 2.4 Solubility of pa (i) Maximum solut water system. (ii) Minimum solu amine - water syste (iii) Maximum and type : Nicotine - w

B.A. / B.Sc. / M.A. / M.Sc.	: **B.Sc. III**	
NAME OF SUBJECT	: Inorganic Chemistry	
SEM I / II / III / IV / V / VI	: Sem. VI	
COURSE NUMBER (PAPER NUMBER)	**: P - XIV**	
TITLE OF COURSE (NAME OF PAPER)	**: Inorganic Chemistry**	
COURSE CONTENT	**OBJECTIVES**	**OUTCOME**
1) Study of F-block Elements 1.1 Lanthanides :- I) Introduction II) Electronic configuration III) Occurrence IV) Separation of Lanthanides i) Bulk separation methods ii) Individual separation of lanthanides- Mention names of methods only(Ion exchange method in detail) 1.2 Actinides :- I) Introduction II) Electronic configuration III) General Methods of preparation – a) Neutron-capture followed by β-decay b) Accelerated projectile bombardment method	1. To help the students to understand about lanthanide and actinide 2. To help the students to understand electronic configuration, occurrence separation techniques of lanthanides 3. To help the students to understand electronic configuration, methods of preparation of trans uranic element	1. Students understand lanthanide and actinides 2. Students understand electronic configuration, separation techniques of lanthanide 3. Students understand preaparation techniques of actinide

c) Heavy-ion bombardment method 1.3 IUPAC Nomenclature of the Super Heavy Elements with atomic numbers (Z) greater than 100.		
2) Metals and Semiconductors. 2.1 Introduction. 2.2 Properties of metallic solids. 2.3 Theories of bonding in metal. a) Free electron theory. b) Molecular orbital theory (Band theory). 2.4 Classification of solids as conductor, insulators and semiconductors on the basis of band theory. 2.5 Semiconductors: a) Types of semiconductors - intrinsic and extrinsic semiconductors. b) Applications of semiconductors. 2.6 Superconductors : a) Ceramic superconductors - Preparation and structures of mixed oxide $YBa_2Cu_3O_{7-x}$ b) Applications of superconductors.	Students should get knowledge about; Metallic solids, bonding in metallic solids and their classification as conductor, insulator and conductor.	Students understood the preparation and conduction mechanism in semiconductor and ceramic superconductors.
3) Structural Chemistry. 3.1 Structural study of following compounds. i) Diborane. ii) Borazine. iii) Xenon compounds → XeF_2, XeF_6, XeO_4 (w.r.t. VBT only.) 3.2 Structural study of Oxides of Sulphur and Phosphorous: i) Oxides of Sulphur : SO_2 and SO_3 ii) Oxides of Phosphorous : P_4O_6 and P_4O_{10}	To get Knowledge of structure and bonding of some inorganic halide and oxide compounds.	Students understood the, Hybridization concept, VSEPR theory, structure and bonding in halides and oxides of Xe, S & P.
4) Corrosion and Passivity. **4.1 Corrosion :-** I. Introduction II. Types of corrosion III. Electrochemical theory of corrosion	To get knowledge of the concept of corrosion and passivity.	Students understood the Concept of corrosion and passivity, their effects, protection and applications.

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IV. Factors affecting the corrosion i) Position of metal in emf series. ii) Purity of metal. iii) Effect of moisture. iv) Effect of oxygen. v) Hydrogen over voltage. V. Methods of protection of metals from corrosion. **4.2 Passivity :-** I. Definition. II. Types of passivity. III. Oxide film theory. IV. Application of passivity.		
5. Organometallic Chemistry. 5.1 Introduction - Definition, 5.2 Nomenclature of organometallic compounds. 5.3 Synthesis and structural study of alkyl and aryl compounds of Li, Be and Al. 5.4 Mononuclear carbonyl and nature of bonding in simple metal carbonyls.	1. To help the students to understand organiometallic compounds 2. To help the students to understand synthesis of organometallic compounds	1. Students understand concept of organometallic compounds 2. Students understand synthesis of organometallic compounds

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B.Sc. III		
NAME OF SUBJECT: Organic Chemistry		
SEM VI		
COURSE NUMBER (PAPER NUMBER) P-XV		
TITLE OF COURSE (NAME OF PAPER): Organic Chemistry		
COURSE CONTENT	**OBJECTIVES**	
1 Heterocyclic compounds 1.1 Introduction and classification. 1.2 Pyrrole. 1.2.1 Methods of synthesis : i) From acetylene. ii) From furan. iii) From succinamide.	To study the classification of Heterocyclic compounds. To study methods of preparation and chemical reactions of Pyrrole, Pyridine, and Quinoline.	**Students gain th** Classification of H Methods of prepa Pyrrole, Pyridine,

1.2.2 Physical properties. 1.2.3 Reactivity of pyrrole : i) Basic character. ii) Acidic character. iii) Electrophilic substitution with general mechanism. 1.2.4 Chemical reactions : i) Reduction. ii) Oxidation. iii) Nitration, sulphonation and halogenation. iv) Friedel Craft's reaction. v) Coupling reaction. 1.3 Pyridine. 1.3.1 Methods of synthesis. i) From acetylene and hydrogen cyanide. ii) From piperidine. 1.3.2 Physical properties. 1.3.3 Chemical reactions i) Basic character ii) Electrophilic substitution(nitration, sulphonationabdbromination) reactions iii) Nucleophilic substitution - General mechanism, Reactions with sodamide, sodium hydroxide and n-Butyl lithium. 1.4 Quinoline 1.4.1 Synthesis - Skraup's synthesis 1.4.2 Physical properties. 1.4.3 Reactions of quinoline : i) Electrophilic substitution reactions - Nitration and sulphonation. ii) Nucleophilic substitution reactions - Reactions with sodamide, alkylation and arylation. iii) Reduction.		
2. Carbohydrates 2.1 Introduction. 2.2 Classification and nomenclature. 2.3 Monosaccharide D-glucose - Open chain structure. 2.4 Chain lengthening of Aldoses - Kiliani synthesis. 2.5 Chain shortening of Aldoses - Weerman's reaction. 2.6 Interconversion of glucose and fructose. 2.7 Configuration of D-glucose from D-arabinose.	**To study the**. 2.2 Classification and nomenclature. 2.3 Monosaccharide D-glucose - Open chain structure. 2.4 Chain lengthening of Aldoses - Kiliani synthesis. 2.5 Chain shortening of Aldoses - Weerman's reaction. 2.6 Interconversion of glucose and fructose. 2.7 Configuration of D-glucose from D-arabinose.	**Students gain th** Classification and Configuration of Objections agains glucose. Ring structure of size of ring by, Methylation meth Periodic acid trea Disaccharides - In - Sources, structu formulae and uses

		Polysaccharides - structural formula
2.8 Objections against open chain structure of D-glucose. 2.9 Muta-rotation with mechanism. 2.10 Ring structure of D-glucose - Determination of size of ring by, i) Methylation method. ii) Periodic acid treatment method. iv) X - ray analysis. 2.11 Disaccharides - Introduction, sucrose and lactose - Sources, structural formulae and uses. 2.12 Polysaccharides - Introduction starch, - Sources, structural formulae and uses.	2.8 Objections against open chain structure of D-glucose. 2.9 Muta-rotation with mechanism. 2.10 Ring structure of D-glucose - Determination of size of ring by, i) Methylation method. ii) Periodic acid treatment method. iv) X - ray analysis. 2.11 Disaccharides - Introduction, sucrose and lactose - Sources, structural formulae and uses. 2.12 Polysaccharides - Introduction starch, - Sources, structural formulae and uses.	
3. Vitamins and Hormones 3.1 General idea of vitamins, structure and synthesis of vitamin A 3.2 General idea of hormones, structure and synthesis of Adrenaline and Thyroxin	To study the General idea of vitamins, structure and synthesis of vitamin A General idea of hormones, structure and synthesis of Adrenaline and Thyroxin	**Students gain th** General idea of vi of vitamin A General idea of h of Adrenaline and
4. Pharmaceuticals 4.1 Introduction. 4.2 Qualities of ideal drug. 4.3 Methods of classification of drugs - Classification based on the therapeutical action. 4.4 Brief idea of pencillin-G (constitution, synthesis not expected) 4.5 Synthesis and uses of the following drugs : i) Antimalerials - Paludrin. ii) Antituberculars - Isoniazide and Ethambutol. iii) C. N. S. drugs - Phenobarbitone. iv) Antidiabetics - Tolbutamide. v) Antiinflammatory drugs - Ibuprofen. vi) Antibiotic - Chloromycetin.	To study the Qualities of ideal drug. Methods of classification of drugs - Classification based on the therapeutical action. Synthesis and uses of the following drugs : i) Antimalerials - Paludrin. ii) Antituberculars - Isoniazide and Ethambutol. iii) C. N. S. drugs - Phenobarbitone. iv) Antidiabetics - Tolbutamide. v) Antiinflammatory drugs - Ibuprofen. vi) Antibiotic - Chloromycetin.	**Students gain th** Qualities of ideal Methods of classi based on the thera Synthesis and use i) Antimalerials - ii) Antitubercular iii) C. N. S. drugs iv) Antidiabetics v) Antiinflammat vi) Antibiotic - Cl
5 Synthetic dyes. 5.1 Introduction, Qualities of good dye. 5.2. Classification based on constitution and methods of applications. 5.3 Witt's theory - Colour and constitution. 5.4 Synthesis of Orange IV, Malechite green, phenolphthalein.	**To study the:** Qualities of good dye. Classification based on constitution and methods of applications. Witt's theory - Colour and constitution. Synthesis of Orange IV, Malechite green, phenolphthalein.	**Students gain th** Qualities of good Classification bas of applications. Witt's theory - Co Synthesis of Oran phenolphthalein.
6 Agrochemicals. 6.1 General idea of agrochemicals including	**To study the:** General idea of agrochemicals including	**Students gain th** General idea of ag

pyrethroides. 6.2 Synthesis and uses of the following agrochemicals : i) Indole-3-acetic acid. ii) Monocrotophos. iii) Methoxychlor. iv) Ethophan. v) Carbaryl.	pyrethroides. Synthesis and uses of the following agrochemicals : i) Indole-3-acetic acid. ii) Monocrotophos. iii) Methoxychlor. iv) Ethophan. v) Carbaryl.	pyrethroides. Synthesis and use agrochemicals : i) Indole-3-acetic ii) Monocrotopho iii) Methoxychlor iv) Ethophan. v) Carbaryl.of TM

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B.Sc. III		
NAME OF SUBJECT: Analytical and Industrial Organic Chemistry		
SEM VI		
COURSE NUMBER (PAPER NUMBER) P-XVI		
TITLE OF COURSE (NAME OF PAPER): Analytical and Industrial Organic Chemistry		
COURSE CONTENT	**OBJECTIVES**	**OUTCOME**
1. Soaps and Detergents. [08] 1.1 Soap i) Raw materials. ii) Types of soaps. iii) Manufacture of soap - Hot process. iv) Cleansing action of soaps. 1.2 Detergents i) Raw materials. ii) Types of detergents - Cationic, anionic, amphoteric, neutral detertents. iii) Preparation of teepol and deriphat. 1.3 Comparison between soaps and detergents.	**To study the:** Soap Raw materials. Types of soaps. Manufacture of soap - Hot process. Cleansing action of soaps. Detergents Raw materials. Types of detergents - Cationic, anionic, amphoteric, neutral detertents. Preparation of teepol and deriphat. Comparison between soaps and detergents.	**Students gain the understanding of:** Soap and detergents, their raw materials, manufacturing processes, cleansing action of soap and types of detergents.
2. Synthetic polymers. [08] 2.1 Introduction. 2.2 Classification : i) According to origin, composition,	**To study the:** Classification of polymer. Process of addition polymerisation - free radical	**Students gain the understanding of:** -Polmerisation processes, Methods of

method of preparation and general physicalproperties. ii) Classification based upon structure. 2.3 Process of addition polymerisation - free radical polymerisation of alkenes and Dienes. 2.4 Ionic polymerisation. 2.5 Ziegler - Natta polymerisation. 2.6 Methods of preparation and uses of : i) Polythene. ii) Polystyrene iii) PVC. iv) Phenol formaldehyde resin. v) Urea formaldehyde resin vi) Poly urethane 2.7 Natural rubber : General idea and vulcanisation. 2.8 Synthetic rubbers : Synthesis and uses of - i) Polychloroprene, ii) Buna rubber - Buna N and Buna S.	polymerisation of alkenes and Dienes. Methods of preparation and uses of : i) Polythene. ii) Polystyrene iii) PVC. iv) Phenol formaldehyde resin. v) Urea formaldehyde resin vi) Poly urethane 2.7 Natural rubber : General idea and vulcanisation. 2.8 Synthetic rubbers : Synthesis and uses of - i) Polychloroprene, ii) Buna rubber - Buna N and Buna S.	preparation and uses of : i) Polythene. ii) Polystyrene iii) PVC. iv) Phenol formaldehyde resin. v) Urea formaldehyde resin vi) Poly urethane 2.7 Natural rubber : General idea and vulcanisation. 2.8 Synthetic rubbers : Synthesis and uses of - i) Polychloroprene, ii) Buna rubber - Buna N and Buna S.
3. Sugar and Alcohol Industry [09] 3.1 Manufacture of raw cane sugar. 3.2 Refining of raw sugar. 3.3 White sugar. 3.4 By-products of sugar industry. 3.4.1 Manufacture of ethyl alcohol from molasses 3.4.2 Rectified spirit, Denatured spirit absolute alcohol and power alcohol. 3.4.3 By-products of alcohol industry.	**To study the:** Manufacture of raw cane sugar. Refining of raw sugar. White sugar. By-products of sugar industry. Manufacture of ethyl alcohol from molasses Rectified spirit, Denatured spirit absolute alcohol and power alcohol. By-products of alcohol industry.	**Students gain the understanding of:** Manufacture of raw cane sugar. Refining of raw sugar. White sugar. By-products of sugar industry. Manufacture of ethyl alcohol from molasses Rectified spirit, Denatured spirit absolute alcohol and power alcohol. By-products of alcohol industry.
4. Textile chemistry [4.1 Introduction, classification of fibers. 4.2 Sizing: object of sizing, sizing ingredients and their functions. 4.3 General idea of processes like singeing, desizing, scouring. 4.4 Bleaching: i) Brief study of the outline of the process of bleaching cotton and synthetic material. 4.5 Dyeing : Study of dyeing of cellulosic	**To study the:** Classification of fibers. Sizing: object of sizing, sizing ingredients and their functions. General idea of processes like singeing, desizing, scouring, Bleaching, Dyeing. .	**Students gain the understanding of:** Classification of fibers. Sizing: object of sizing, sizing ingredients and their functions. General idea of processes like singeing, desizing, scouring, Bleaching, Dyeing.

material and synthetic fibers with dyes like direct,vat, reactive and disperse dyes.		
5. Green Chemistry. 5.1 Introduction - Twelve principles of green chemistry. 5.2 Zeolites - Friedel Craft's alkylation and acylation, oxidation of benzene to phenol and benzoquinone, Reduction of benzoquinone to hydroquinone. 5.3 Biocatalytic reaction - Hydroxylation and oxidation using enzymes. 5.4 Introduction to microwave assisted reactions.	**To study the:** Twelve principles of green chemistry. Zeolites - Friedel Craft's alkylation and acylation, oxidation of benzene to phenol and benzoquinone, Reduction of benzoquinone to hydroquinone. Biocatalytic reaction - Hydroxylation and oxidation using enzymes. Introduction to microwave assisted reactions.	**Students gain the understanding of:** Twelve principles of green chemistry. Zeolites - Friedel Craft's alkylation and acylation, oxidation of benzene to phenol and benzoquinone, Reduction of benzoquinone to hydroquinone. Biocatalytic reaction - Hydroxylation and oxidation using enzymes. Introduction to microwave assisted reactions.
6. Chromatography 6.1 Introduction. 6.2 General principles. 6.3 Classification. 6.4 Study of following chromatographic techniques with reference to principle, methodology and applications. i) Paper chromatography. ii) Column chromatography. iii) Thin layer chromatography. iv) Gas chromatography	**To study the:** General principles. Classification. Study of following chromatographic techniques with reference to principle, methodologyand applications. i) Paper chromatography. ii) Column chromatography. iii) Thin layer chromatography. iv) Gas chromatography	**Students gain the understanding of:** General principles. Classification. Study of following chromatographic techniques with reference to principle, methodology and applications. i) Paper chromatography. ii) Column chromatography. iii) Thin layer chromatography. iv) Gas chromatography

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