DBF DAYANAND COLLEGE OF ARTS AND SCIENCE, SOLAPUR

Name of Department: CHEMISTRY

Program Outcome [B.Sc. Chemistry]

- Obtain knowledge with facts and findings related to chemistry
- Understands the fundamental concept, principles and working of theories related to scientific phenomena
- Gain enough skill in handling instruments, planning and execution of innovative experiments
- Obtain the observations and drawing logical answers from the conducted experiments.
- Able to do creative thinking and put the conclusions based on scientific findings.
- Develop the critical thinking ability and analytical mindset.
- Realize the knowledge of the subject and utilize it for the benefit of the human mankind.

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

COURSE OUTCOME

Name of Department: Chemistry

B.Sc.I		
NAME OF SUBJECT: Physical Chemistry		
SEM I		
COURSE NUMBER (PAPER NUMBER): P-I		
TITLE OF COURSE (NAME OF PAPER): Physical Chemistry		
COURSE CONTENT	**OBJECTIVES**	**OUTCOME**
Chemical kinetics 1.1 Chemical Kinetics and it's scope, Rate of reaction, Definition and units of rate constant. Factors affecting rate of reaction. Concentration, pressure, temperature and catalyst. 1.2 Order and Molecularity of reaction. 1.3 First order reaction: Derivation of Rate constant. Characteristics of first order reaction. Examples: Decomposition of N_2O_5 1.4 Second order reaction: Derivation of rate constant for equal and unequal concentration of the reactants. Characteristics of Second order reaction. Examples :i) Reaction between $K_2S_2O_8$ and KI . 1.5 Pseudo-unimolecular reactions such as Hydrolysis of methyl acetate in presence of Acid. 1.6 Methods to determine the order of reaction:	**TO know the basic concept of** 1.1 Chemical Kinetics and it's scope, Rate of reaction, Definition and units of rate constant. Factors affecting rate of reaction. Concentration, pressure, temperature and catalyst. 1.2 Order and Molecularity of reaction. 1.3 First order reaction: Derivation of Rate constant. Characteristics of first order reaction. Examples: Decomposition of N_2O_5 1.4 Second order reaction: Derivation of rate constant for equal and unequal concentration of the reactants. Characteristics of Second order reaction. Examples :i) Reaction between $K_2S_2O_8$ and KI . 1.5 Pseudo-unimolecular reactions such as Hydrolysis of methyl acetate in presence of Acid. 1.6 Methods to determine the	**Students should understand** 1.1 Chemical Kinetics and it's scope, Rate of reaction, Definition and units of rate constant. Factors affecting rate of reaction. Concentration, pressure, temperature and catalyst. 1.2 Order and Molecularity of reaction. 1.3 First order reaction: Derivation of Rate constant. Characteristics of first order reaction. Examples: Decomposition of N_2O_5 1.4 Second order reaction: Derivation of rate constant for equal and unequal concentration of the reactants. Characteristics of Second order reaction. Examples :i) Reaction between $K_2S_2O_8$ and KI . 1.5 Pseudo-unimolecular reactions such as Hydrolysis of methyl acetate in presence of Acid. 1.6 Methods to determine the order of reaction:

a) Integration method, b) Graphical method c) Half change method, d) Ostwald's isolation method (Numerical Problems Expected)	order of reaction: a) Integration method, b) Graphical method c) Half change method, d) Ostwald's isolation method (Numerical Problems Expected)	a) Integration method, b) Graphical method c) Half change method, d) Ostwald's isolation method (Numerical Problems Expected)ents should under stand the basic concept like
Mathematical concept 2.1 Graphical representation : Graph paper, co-ordinates of a point, equation of straight line and intercept, plotting of graph based on experimental data. 2.2 Derivative : Rules of differentiation (without proof) pertaining to algebraic and exponential functions. Example related to chemistry. 2.3 Integration : Rules of Integration (without proof) pertaining to algebraic and exponential functions. Example related to chemistry. (Numerical Problems not expected)	**To develop a skill of solving Numerical Problems.** 2.1 Graphical representation : Graph paper, co-ordinates of a point, equation of straight line and intercept, plotting of graph based on experimental data. 2.2 Derivative : Rules of differentiation (without proof) pertaining to algebraic and exponential functions. Example related to chemistry. 2.3 Integration : Rules of Integration (without proof) pertaining to algebraic and exponential functions. Example related to chemistry. (Numerical Problems not expected)	**Students should increase the ability of solving Numerical Problems.** 2.1 Graphical representation : Graph paper, co-ordinates of a point, equation of straight line and intercept, plotting of graph based on experimental data. 2.2 Derivative : Rules of differentiation (without proof) pertaining to algebraic and exponential functions. Example related to chemistry. 2.3 Integration : Rules of Integration (without proof) pertaining to algebraic and exponential functions. Example related to chemistry. (Numerical Problems not expected)
Thermodynamics 3.1 Spontaneous and non spontaneous processes, Second law of thermodynamics and its different statements. 3.2 Carnot's Theorem (Heat engine), Carnot cycle and its efficiency. (Numerical Problems Expected4.1 a) **Gaseous State** Ideal and Non ideal gases, b) Deviation from ideal behaviour. (Only Boyle's law) c) Causes of deviation, van der Waal's equation, explanation	**To understand the basic concept like** 3.1 Spontaneous and non spontaneous processes, Second law of thermodynamics and its different statements. 3.2 Carnot's Theorem (Heat engine), Carnot cycle and its efficiency. (Numerical Problems Expected **To understand the basic**	**Students Should understand the basic concepts in Thermodynamics.** 3.1 Spontaneous and non spontaneous processes, Second law of thermodynamics and its different statements. 3.2 Carnot's Theorem (Heat engine), Carnot cycle and its efficiency. (Numerical Problems Expected **Students Should understand the basic concepts in** Ideal and Non ideal gases, b)

of real gas behavior by van der Waal's equation. 4.2 Critical Phenomena : PV-Isotherms of real gases (Andrew's isotherms), continuity of state, Relationship between critical constants and van der Waal's constants. 4.3 Liquification of gases, Joule-Thomson effect. (Numerical Problems expected)	**concept like** Ideal and Non ideal gases, b) Deviation from ideal behaviour. (Only Boyle's law) c) Causes of deviation, van der Waal's equation, explanation of real gas behavior by van der Waal's equation. 4.2 Critical Phenomena : PV-Isotherms of real gases (Andrew's isotherms), continuity of state, Relationship between critical constants and van der Waal's constants. 4.3 Liquification of gases, Joule-Thomson effect. (Numerical Problems expected)	Deviation from ideal behaviour. (Only Boyle's law) c) Causes of deviation, van der Waal's equation, explanation of real gas behavior by van der Waal's equation. 4.2 Critical Phenomena : PV-Isotherms of real gases (Andrew's isotherms), continuity of state, Relationship between critical constants and van der Waal's constants. 4.3 Liquification of gases, Joule-Thomson effect. (Numerical Problems expected)

Signature of HOD

B.A. / B.Sc. / M.A. / M.Sc.	: **B.Sc. I**	
NAME OF SUBJECT	: Inorganic Chemistry	
SEM I / II / III / IV / V / VI	: Sem. I	
COURSE NUMBER (PAPER NUMBER)	: P-II	
TITLE OF COURSE (NAME OF PAPER)	**: Inorganic Chemistry**	
COURSE CONTENT	OBJECTIVES	OUTCOME
1. Atomic Structure and periodic properties 1.1 Atomic Structure a) Shapes of s, p, d orbital's. b) Aufbau and Pauli's exclusion principle, Hund's rule of maximum multiplicity c) General electronic configuration of s and p	Students should get knowledge about structure and periodical properties of Atoms.	Students have understood about the atomic structure, electronic configuration, and periodical properties of Atoms from s and

block elements. 1.2 General Characteristics of s and p block elements w.r.t. Atomic and Ionic radii, Ionization energy, Electron affinity, Electronegativity, Reactivity, Melting and Boiling point		p block elements.
2. Chemical bonding and Ionic Solids 2.1 Types of chemical bonding 2.2 Ionic Bonding a) Formation of ionic bond, Energetics of ionic bonding : Ionisation potential, Electron affinity and Lattice energy. b) Characteristics of ionic compounds. c) Born-Haber Cycle for Alkali metal halide (NaCl). d) Fajan's rules. 2.3 Radius ratio and crystal structure. a) Definition: Radius ratio (r+ / r-), Coordination number, Stoichiometry and unit cell. b) Concept and calculation of radius ratio (r+ / r-) for ionic solid with octahedral geometry. c) Radius ratio effect on geometry. d) Crystal structure of NaCl and CsCl w.r.t. unit cell, radius ratio, coordination number and stoichiometry.	Students should get knowledge about Chemical bonding and crystal structure of ionic solids.	Students have understood about; How the chemical bonds are formed and what are their types. Stability of crystal structure, Internal structure of ionic solids like NaCl, CsCl etc.
3. Covalent bonding: Valence Bond Theory (VBT) Approach 3.1 Valence Bond Theory: Heitler–London Theory and Pauling-Slater Theory 3.2 Limitations of VBT 3.3 Need of Hybridization 3.4 Types of hybridization and shapes of simple inorganic molecules: $BeCl_2$, BF_3, $SiCl_4$, PCl_5,SF_6, IF_7. 3.5 Valence Shell Electron Pair Repulsion (VSEPR) Theory w.r.t. NH_3, H_2O, ClF_3	Students should get knowledge about hybridization concept, structure and bonding in covalent inorganic compounds.	Students have understood about formation of diatomic molecules, concept of hybridization, structure and bonding in covalent inorganic compounds.
4. Covalent bonding: Molecular Orbital Theory (MOT) Approach 4.1 Atomic and Molecular orbitals. 4.2 L.C.A.O. Principle 4.3 Bonding, Antibonding and Nonbonding Molecular orbitals. 4.4 Conditions for successful overlap 4.5 Different types of overlap (s-s, s-px, px -	Students should get knowledge about formation of molecular orbital's, bonding and characteristics of simple diatomic molecules.	Students have understood about construction of molecular orbital's and there use for the explanation of bonding and characteristics

px and py- py or pz- pz) 4.6 Energy level sequence of molecular orbitals for n = 1 and n = 2 4.7 M. O. Diagrams for: a) Homonuclear diatomic molecule. H_2, Li_2, Be_2, C_2, N_2 and O_2 b) Heteronuclear diatomic molecules CO and NO w.r.t. bond order stability and magnetic properties.		(Magnetic behavior and stability) in simple diatomic molecules, Concept of electron deficient bonding (2C-1e, 3C-2e etc.)

Signature of HOD

B.Sc. I		
NAME OF SUBJECT: Organic Chemistry		
SEM II		
COURSE NUMBER (PAPER NUMBER) P-III		
TITLE OF COURSE (NAME OF PAPER): OrganicChemistry		
COURSE CONTENT	**OBJECTIVES**	**OUTCOME**
1. Fundamentals of organic reaction mechanism 1.1 Meaning of reaction mechanism. 1.2 Curved arrow notation, Half headed and double headed arrows. 1.3 Types of bond breaking :Homolytic and Heterolytic. 1.4 Types of reagents : Electrophilic and Nucleophilic. 1.5 Types and sub-types of following organic reactions with definition and at least one example of each. a) Substitution b) Addition c) Elimination d) Rearrangement. (Mechanism is not expected) 1.6 Reactive Intermediates with examples carbocations, carbanions (formation, structure,	**To study** Meanings of terms involved in organic reactions like arrow notations, types of bonding, Types of reagents and intermediates formed in the reactions.	**Students gain in understanding of :** Basic terms involved in the organic reactions. Types and subtypes of reactions, reagents and intermediates in the organic reactions.

stability and reactions are expected). Carbon free radicals, carbenes, arenes, nitrenes (Definition with example only)		
2. Structure and Bonding 2.1 Hybridization: sp^3, sp^2 and sp w.r.t. methane, ethylene and acetylene respectively. 2.2 Bond length, Bond angle and Bond energy with factors affecting these properties w.r.t. : sp^3, sp^2 and sp hybridization 2.3 Resonance effect with respect to phenol, and nitrobenzene. 2.4 Hyperconjugation w.r.t. toluene. 2.5 Inductive effect, + I and - I . 2.6 Steric effect w.r.t. mesitoic acid	**To study** 2.1 Hybridization: sp^3, sp^2 and sp w.r.t. methane, ethylene and acetylene respectively. 2.2 Bond length, Bond angle and Bond energy with factors affecting these properties w.r.t. : sp^3, sp^2 and sp hybridization 2.3 Resonance effect with respect to phenol, and nitrobenzene. 2.4 Hyperconjugation w.r.t. toluene. 2.5 Inductive effect, + I and - I . 2.6 Steric effect w.r.t. mesitoic acid	**Students gain an understanding of :** The Hybridization involved in molecule and get knowledge of Bond length, Bond angle and Bond energy possess by molecule. Students gains the knowledge of various effects exerted by the organic compounds like Resonance effect with respect to phenol, and nitrobenzene, Hyperconjugation w.r.t. toluene, Inductive effect, + I and – I, Steric effect w.r.t. mesitoic acid
3. Alkanes and Cycloalkanes 3.1 Alkanes : Methods of formation with special reference to Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation of carboxylic acid. 3.2 Mechanism of free radical halogenation of alkanes. 3.3 Cycloalkanes - Nomenclature methods of formation (a) Internal Wurtz reaction (b) Distillation of calcium or barium salt of dicarboxylic acid. 3.4 Chemical properties of cyclopropane (i) Free radical substitution of chlorine in presence of light. (ii) Action of HBr and conc. H_2SO_4 iii) Catalytic reduction by	**To study** 3.1 Alkanes : Methods of formation with special reference to Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation of carboxylic acid. 3.2 Mechanism of free radical halogenation of alkanes. 3.3 Cycloalkanes - Nomenclature methods of formation (a) Internal Wurtz reaction (b) Distillation of calcium or barium salt of dicarboxylic acid. 3.4 Chemical properties of cyclopropane (i) Free radical substitution of chlorine in presence of light. (ii) Action of HBr and conc. H_2SO_4 iii) Catalytic reduction by H_2/Ni	**Students gain an understanding of :** 3.1 Alkanes : Methods of formation with special reference to Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation of carboxylic acid. 3.2 Mechanism of free radical halogenation of alkanes. 3.3 Cycloalkanes - Nomenclature methods of formation (a) Internal Wurtz reaction (b) Distillation of calcium or barium salt of dicarboxylic acid. 3.4 Chemical properties

H_2/Ni		of cyclopropane (i) Free radical substitution of chlorine in presence of light. (ii) Action of HBr and conc. H_2SO_4 iii) Catalytic reduction by H_2/Ni
4. Alkenes, Dienes and Alkynes (Contact hrs: 09) 4.1 Nomenclature of alkenes. 4.2 Methods of formation of alkenes with mechanism i) By dehydration of lower alcohols. ii) By dehydrohalogenation of lower alkyl halides. 4.3 Chemical reactions of alkenes - Hydrogenation, Electrophilic and free radical additions, Hydroboration, Oxidation, Epoxidation, Ozonolysis, Hydration, Hydroxylation, Oxidation with $KMnO_4$, Polymerisation of alkenes - ethylene and propylene 4.4 Nomenclature and classification of dienes. 4.5 Isolated, Conjugated and cumulated dienes. 4.6 Butadiene-Methods of formation,polymerisation,1:2 and 1:4additions and Diels-Alder reaction. 4.7 Alkynes - Nomenclature, Acidity of alkynes. 4.8 Electrophilic and Nucleophilic addition reactions, Hydroboration, oxidation.	**To study** 4.1 Nomenclature of alkenes. 4.2 Methods of formation of alkenes with mechanism i) By dehydration of lower alcohols. ii) By dehydrohalogenation of lower alkyl halides. 4.3 Chemical reactions of alkenes - Hydrogenation, Electrophilic and free radical additions, Hydroboration, Oxidation, Epoxidation, Ozonolysis, Hydration, Hydroxylation, Oxidation with $KMnO_4$, Polymerisation of alkenes - ethylene and propylene 4.4 Nomenclature and classification of dienes. 4.5 Isolated, Conjugated and cumulated dienes. 4.6 Butadiene-Methods of formation,polymerisation,1:2 and 1:4additions and Diels-Alder reaction. 4.7 Alkynes - Nomenclature, Acidity of alkynes. 4.8 Electrophilic and Nucleophilic addition reactions, Hydroboration, oxidation.	**Students gain an understanding of :** Nomenclature, methods of preparations, chemical reactions of Alkenes, Dienes and Alkynes.

5. Stereochemistry of organic compounds 5.1 Types of stereo-isomerism - Optical isomerism, Geometrical isomerism and Conformational isomerism. 5.2 Chiral center [Explanation with lactic acid] 5.3 Elements of symmetry 5.4 Optical isomerism in lactic acid, tartaric acid and 2,3 - dihydroxybutanic acid 5.5 Enantiomers and diastereoisomers. 5.6 Racemic modification. 5.7 Geometrical isomerism-cause of geometrical isomerism. 5.8 Geometrical isomerism w.r.t. C = C Geometrical isomerism in maleic acid and fumaric acid.	**To study** 5.1 Types of stereo-isomerism - Optical isomerism, Geometrical isomerism and Conformational isomerism. 5.2 Chiral center [Explanation with lactic acid] 5.3 Elements of symmetry 5.4 Optical isomerism in lactic acid, tartaric acid and 2,3 - dihydroxybutanic acid 5.5 Enantiomers and diastereoisomers. 5.6 Racemic modification. 5.7 Geometrical isomerism-cause of geometrical isomerism. 5.8 Geometrical isomerism w.r.t. C = C Geometrical isomerism in maleic acid and fumaric acid.	**Students gain an understanding of :** Types of stereoisomerism, their examples, Enantiomers and diastereoisomers. Racemic modification. Geometrical isomerism-cause of geometrical isomerism. Geometrical isomerism w.r.t. C = C Geometrical isomerism in maleic acid and fumaric acid.
6. Aromaticity and Benzene 6.1 Meaning of the terms - Aromatic, non-aromatic, antiaromatic and psuedoaromatic compounds. 6.2 a) Kekule structure of benzene b) Resonance structures of benzene. c) Molecular orbital picture of benzene. d) Representation of benzene ring. 6.3 Modern theory of aromaticity. Fundamental Concepts - delocalisation of electrons, coplanarity and Huckel's (4n + 2) π rule. Applications of Huckel's rule to napthalene,	**To study** 6.1 Meaning of the terms - Aromatic, non-aromatic, antiaromatic and psuedoaromatic compounds. 6.2 a) Kekule structure of benzene b) Resonance structures of benzene. c) Molecular orbital picture of benzene. d) Representation of benzene ring. 6.3 Modern theory of aromaticity. Fundamental Concepts - delocalisation of electrons, coplanarity and Huckel's (4n + 2) π rule. Applications of Huckel's rule to napthalene, pyrrole and pyridine. 6.4 Mechanism of electrophilic aromatic substitution in benzene w.r.t. nitration, sulphonation,	**Students gain an understanding of :** Meaning of different terms, Resonance and Molecular orbital picture of benzene. Fundamental Concepts - delocalisation of electrons, Mechanism of electrophilic aromatic substitution in benzene w.r.t. nitration, sulphonation, halogenation and Friedel - Craft's reaction-alkylation and acylation

pyrrole and pyridine. 6.4 Mechanism of electrophilic aromatic substitution in benzene w.r.t. nitration, sulphonation, halogenation and Friedel - Craft's reaction- alkylation and acylation	halogenation and Friedel - Craft's reaction- alkylation and acylation	

Signature of HOD

B.Sc. I		
NAME OF SUBJECT: Chemistry		
SEM : II		
COURSE NUMBER (PAPER NUMBER): P-IV		
TITLE OF COURSE (NAME OF PAPER): Analytical Chemistry		
COURSE CONTENT	**OBJECTIVES**	**OUTCOME**
1. Physical properties of liquids 1.1 Introduction, additive and constitutive properties1.2 **Viscosity:** coefficient of viscosity, determination of viscosity by Ostwald's Viscometer 1.3 **Surface tension:**Determination of surface tension by Drop –Weight method 1.4 **Parachor:**Macleod equation and its modification by Sugden, applications of parachor in thedetermination of molecular structures as benzene and NO2 group 1.5 **Dipole moment:** electrical polarization of molecules 1.6 Use of dipole moment in the study of molecular structure 1.7**Refractometery:** Refractive index, Snell's law 1.8 Specific and molecular refractivity, Abbe's refractometer: Principle-critical angle phenomenon-construction, working and advantages 1.9 Molecular refractivity and chemical constitution	To understand the properties like 1.1 Introduction, additive and constitutive properties 1.2 Viscosity, coefficient of viscosity, determination of viscosity by Ostwald's Viscometer 1.3 Surface tension:- Determination of surface tension by Drop –Weight method 1.4 Parachor:-Macleod equation and its modification by Sugden, applications of parachor in the determination of molecular structures as benzene and NO2 group 1.5 Dipole moment, electrical polarization of molecules 1.6 Use of dipole moment in the study of molecular structure 1.7 Refractive index, Snell's law	**Student understands the concepts:** 1.1 Introduction, additive and constitutive properties 1.2 Viscosity, coefficient of viscosity, determination of viscosity by Ostwald's Viscometer 1.3 Surface tension:- Determination of surface tension by Drop –Weight method 1.4 Parachor:-Macleod equation and its modification by Sugden, applications of parachor in the determination of molecular structures as benzene and NO2 group 1.5 Dipole moment, electrical polarization of molecules 1.6 Use of dipole moment in the study of molecular

		structure 1.7 Refractive index, Snell's law
2. Environmental Chemistry: Air pollution 2.1 Introduction: Meaning of terms: Environment, Pollution, Pollutant, Threshold Limit Value (TLV), Dissolved Oxygen (DO), Chemical Oxygen Demand (COD) and Biological Oxygen Demand (BOD) 2.2 Types of Pollution (Only Introduction): Air pollution, Water pollution, Sound pollution, Soil pollution, Automobile pollution and nuclear pollution. 2.3 Air Pollution: Classification of Air pollutants, Oxides of carbon, Sulphur and Nitrogen as air pollutants with respect to source and health hazards.	**To study** Introduction: Meaning of terms: Environment, Pollution, Pollutant, Threshold Limit Value (TLV), Dissolved Oxygen (DO), Chemical Oxygen Demand (COD) and Biological Oxygen Demand (BOD) Types of Pollution (Only Introduction): Air pollution, Water pollution, Sound pollution, Soil pollution, Automobile pollution and nuclear pollution. Air Pollution: Classification of Air pollutants, Oxides of carbon, Sulphur and Nitrogen as air pollutants with respect to source and health hazards.	**Students gain an understanding of :** Introduction: Meaning of terms: Environment, Pollution, Pollutant, Threshold Limit Value (TLV), Dissolved Oxygen (DO), Chemical Oxygen Demand (COD) and Biological Oxygen Demand (BOD) Types of Pollution (Only Introduction): Air pollution, Water pollution, Sound pollution, Soil pollution, Automobile pollution and nuclear pollution. Air Pollution: Classification of Air pollutants, Oxides of carbon, Sulphur and Nitrogen as air pollutants with respect to source and health hazards.
3. Environmental Chemistry: Water pollution 3.1 Introduction: Resources of water, Types of water Pollutants, water Pollution and its sources (Brief Account) 3.2 Treatment of water: A) Potable Water: Parameters of potability of water Step I: Removal of suspended matter : a) Prolonged storage b) Screening c) Sedimentation d) Coagulation e) Filtration Step II: Removal of germs and	**To Study** 3.1 Introduction: Resources of water, Types of water Pollutants, water Pollution and its sources (Brief Account) 3.2 Treatment of water: A) Potable Water: Parameters of potability of water Step I: Removal of suspended matter : a) Prolonged storage b) Screening c) Sedimentation d) Coagulation e) Filtration Step II: Removal of germs and bacteria- Physical and Chemical	**Students gain an understanding of :** Step I: Removal of suspended matter a) Prolonged storage b) Screening c) Sedimentation d) Coagulation e) Filtration Step II: Removal of germs and bacteria- Physical and Chemical method. Physical Methods : a) Boiling b) Exposure to UV or Sunlight

bacteria- Physical and Chemical method. Physical Methods : a) Boiling b) Exposure to UV or Sunlight c) Distillation. Chemical Method : a) Chlorination b) Fluorination c) Ozonisation d) Aeration e) Use of $KMnO_4$ B) Industrial Water: Mention names of the methods only, Ion exchange method in detail. C) Municipal Sewage: Meaning of Sewage; mention the names of methods; activated sludge process in detail.	method. Physical Methods : a) Boiling b) Exposure to UV or Sunlight c) Distillation. Chemical Method : a) Chlorination b) Fluorination c) Ozonisation d) Aeration e) Use of $KMnO_4$ B) Industrial Water: Mention names of the methods only, Ion exchange method in detail. C) Municipal Sewage: Meaning of Sewage; mention the names of methods; activated sludge process in detail.	c) Distillation. Chemical Method : a) Chlorination b) Fluorination c) Ozonisation d) Aeration e) Use of $KMnO_4$ B) Industrial Water: Mention names of the methods only, Ion exchange method in detail. C) Municipal Sewage: Meaning of Sewage; mention the names of methods; activated sludge process in detail.
4. Qualitative and Quantitative elemental analysis 4.1 Qualitative analysis of Carbon, Hydrogen, Nitrogen & Sulphur 4.2 Quantitative analysis of - i) Carbon and hydrogen by Combustion method ii) Nitrogen by Kjeldahl's method iii) Halogen and Sulphur by Carius method. 4.3 Determination of molecular weight of an acid by titration method. 4.4 Empirical formula and molecular formula determination. (Numerical Problems Expected)	**To study** Qualitative analysis of Carbon, Hydrogen, Nitrogen & Sulphur Quantitative analysis of - i) Carbon and hydrogen by Combustion method ii) Nitrogen by Kjeldahl's method iii) Halogen and Sulphur by Carius method. Determination of molecular weight of an acid by titration method. Empirical formula and molecular formula determination. (Numerical Problems Expected)	**Students gain an understanding of :** Qualitative analysis of Carbon, Hydrogen, Nitrogen & Sulphur Quantitative analysis of - i) Carbon and hydrogen by Combustion method ii) Nitrogen by Kjeldahl's method iii) Halogen and Sulphur by Carius method. Determination of molecular weight of an acid by titration method Empirical formula and molecular formula determination. (Numerical Problems Expected)
5. Petroleum and petrochemicals (Contact hrs: 07) 5.1 Constituents and refining of petroleum, cracking, knocking, octane, hydro-forming 5.2 Synthesis and Industrial applications of following petrochemicals: a) Ethylene oxide b) Adipic acid c) Styrene	**To Study** Constituents and refining of petroleum, cracking, knocking, octane, hydro-forming Synthesis and Industrial applications of following petrochemicals: a) Ethylene oxide b) Adipic acid c) Styrene d) 2-Phenyl ethanol e) Paracetamol	**Students gain an understanding of :** Constituents and refining of petroleum, cracking, knocking, octane, hydro-forming Synthesis and Industrial applications of following petrochemicals: a) Ethylene oxide b) Adipic acid

d) 2-Phenyl ethanol e) Paracetamol		c) Styrene d) 2-Phenyl ethanol e) Paracetamol

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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. II		
NAME OF SUBJECT: Organic Chemistry		
SEM III		
COURSE NUMBER (PAPER NUMBER): P-V		
TITLE OF COURSE (NAME OF PAPER): Organic Chemistry		
COURSE CONTENT	**OBJECTIVES**	**OUTCOME**
○ **Spectroscopic Methods Ultra-Violet (UV) absorption :** Introduction to Spectroscopy, Beer – Lambert law (mathematical derivation not expected), Types of electronic transitions, Terms used in UV spectroscopy: Chromophore, Auxochrome, BathocromicHypsochromic, Hypochromic and Hyperchromic shifts, Effect of conjugation on position of UV and visible bands. Calculation of _max by Woodward-Fieser rules for conjugated dienes and enones. Applications of UV spectroscopy – Determination of structure and stereochemistry (cis and trans) spectral problems based on UV.	**To study** Introduction to Spectroscopy, Beer – Lambert law (mathematical derivation not expected), Types of electronic transitions, Terms used in UV spectroscopy: Chromophore, Auxochrome, BathocromicHypsochromic, Hypochromic and Hyperchromic shifts, Effect of conjugation on position of UV and visible bands. Calculation of _max by Woodward-Fieser rules for conjugated dienes and enones. Applications of UV spectroscopy – Determination of structure and stereochemistry (cis and	**Student understands the concepts:** Beer – Lambert law, Types of electronictransitions, Terms used in UV spectroscopy: Chromophore, Auxochrome, BathocromicHypsochromic, Hypochromic and Hyperchromic shifts, Effect of conjugation on position of UV and visible bands. **Students are able to solve** the problems related UV spectroscopy.
2. Stereochemistry (8) 2.1. Geometrical isomerism : Introduction,	**To study the** **2.1. Geometrical**	**Students gain an understanding of :** Types of stereoisomerism, their examples, Enantiomers and

Geometrical isomerism in aldoximes and ketoximes, configuration of ketoximes-Beckmann transformation (Mechanism & Proof are not expected) configuration of aldoximes. **2.2. Conformational Isomerism :** Introduction, conformation of ethane and n-butane and their representation by using Saw-Horse, Fischer (dotted Wedge line) and Newmann's projection formulae. **2.3.** Conformational analysis of ethane and n-butane with the help of energy profile diagrams. **2.4.** Nomenclature – D & L, R & S, E & Z systems	**isomerism :** Introduction, Geometrical isomerism in aldoximes and ketoximes, configuration of ketoximes-Beckmann transformation (Mechanism & Proof are not expected) configuration of aldoximes. **2.2. Conformational Isomerism :** Introduction, conformation of ethane and n-butane and their representation by using Saw-Horse, Fischer (dotted Wedge line) and Newmann's projection formulae. **2.3.** Conformational analysis of ethane and n-butane with the help of energy profile diagrams. **2.4.** Nomenclature – D & L, R & S, E & Z systems	diastereoisomers. Racemic modification. Geometrical isomerism-cause of geometrical isomerism. Geometrical isomerism w.r.t. C = C Geometrical isomerism in maleic acid and fumaric acid.
3. Alcohols and Phenols (8) **3.1. Alcohols : Introduction** i. Dihydric alcohols : Nomenclature, Methods of formation of ethylene glycol from ethylene, ethylene dibromide and ethylene oxide, physical properties & chemical reactions of ethylene glycol – acidic nature, reaction with hydrogen halide, oxidation – lead acetate, HIO_4 and nitric acid, Uses of ethylene glycol. Pinacol formation, Pinacol-Pinacolone rearrangement and its mechanism. ii. Trihydric alcohols : Nomenclature, Methods of formation of glycerol – from fats and oils physical properties. Chemical reactions of glycerol –	**To study the** i. Dihydric alcohols : Nomenclature, Methods of formation of ethylene glycol from ethylene, ethylene dibromide and ethylene oxide, physical properties & chemical reactions of ethylene glycol – acidic nature, reaction with hydrogen halide, oxidation – lead acetate, HIO_4 and nitric acid, Uses of ethylene glycol. Pinacol formation, Pinacol-Pinacolone rearrangement and its mechanism. ii. Trihydric alcohols : Nomenclature, Methods of formation of glycerol – from fats and oils physical properties. Chemical reactions of glycerol – reaction with electropositive metals,	**Students gain an understanding of :** To study the acyclic aliphatic and aromatic alcohols Also the study Mono, Di, Tri- hydric alcohols Synthesis of phenols and alcohols Applications of aliphatic and aromatic alcohols

reaction with electropositive metals, reaction with hydrogen halideHCl and HI Reaction with conc. nitric acid in presence of conc. sulphuric acid. Reactions with potassium hydrogen sulphate, esterification, oxidation. Uses of glycerol. **3.2. Phenols :** Introduction, Reactions of phenol (carbolic acid) : i. Acylation and Fries rearrangement ii. Ether formation and claisen rearrangement iii. Gattermann Synthesis iv. Carboxylation – Kolbe's reaction v. Reimer – Tiemann reaction and its mechanism.	reaction with hydrogen halideHCl and HI Reaction with conc. nitric acid in presence of conc. sulphuric acid. Reactions with potassium hydrogen sulphate, esterification, oxidation. Uses of glycerol. **3.2. Phenols :** Introduction, Reactions of phenol (carbolic acid) : i. Acylation and Fries rearrangement ii. Ether formation and claisen rearrangement iii. Gattermann Synthesis iv. Carboxylation – Kolbe's reaction v. Reimer – Tiemann reaction and its mechanism.	
4. Aldehydes and Ketones Introduction, Nomenclature, structure and reactivity of the carboxyl group. Mechanism of nucleophilic additions to carbonyl group. Study of following reactions with mechanism 1) Aldol condensation (base catalysed), 2) Perkin reaction, 3) Cannizzaro's reaction, 4) Knoevenagel reaction 5) benzoin condensation.	**To study** Nomenclature, structure and reactivity of the carboxyl group. Mechanism of nucleophilic additions to carbonyl group. Study of following reactions with mechanism 1) Aldol condensation (base catalysed), 2) Perkin reaction, 3) Cannizzaro's reaction, 4) Knoevenagel reaction 5) benzoin condensation.	**Students gain an understanding of :** Nomenclature, structure and reactivity of the carboxyl group. Mechanism of nucleophilic additions to carbonyl group. Study of following reactions with mechanism 1) Aldol condensation (base catalysed), 2) Perkin reaction, 3) Cannizzaro's reaction, 4) Knoevenagel reaction 5) benzoin condensation`
5. Ethers and Epoxides **5.1. Ethers :** Introduction, Nomenclature, Methods of formation of anisole by Williamson's synthesis and from diazomethane, chemical	**To study** **5.1. Ethers :** Introduction, Nomenclature, Methods of formation of anisole by Williamson's synthesis and from diazomethane, chemical	**Students gain an understanding of :** **Ethers :** Nomenclature, Methods of formation of anisole by Williamson's synthesis and from diazomethane, chemical reactions of anisole with HI, Gravimetric estimation of $-OCH_3$ group by Ziesel's

reactions of anisole with HI, Gravimetric estimation of $-OCH_3$ group by Ziesel's method (Related problems are expected based on % of $-OCH_3$ and number of $-OCH_3$ groups). **5.2. Epoxides :**Introduction, Nomenclature, commercial method of preparation of ethylene oxide. Acid and base catalysed ring opening of ethylene oxide, reactions of Grignard and organolithium reagents with ethylene oxide.	reactions of anisole with HI, Gravimetric estimation of $-OCH_3$ group by Ziesel's method (Related problems are expected based on % of $-OCH_3$ and number of $-OCH_3$ groups). **5.2. Epoxides :**Introduction, Nomenclature, commercial method of preparation of ethylene oxide. Acid and base catalysed ring opening of ethylene oxide, reactions of Grignard and organolithium reagents with ethylene oxide.	method (Related problems are expected based on % of $-OCH_3$ and number of $-OCH_3$ groups). **Epoxides :**Introduction, Nomenclature, commercial method of preparation of ethylene oxide. Acid and base catalysed ring opening of ethylene oxide, reactions of Grignard and organolithium reagents with ethylene oxide.
6. Carboxylic acids (7) **6.1.** Monocarboxylic acids : Introduction. Methods of formation of Halo acids, di- and trichloroacetic acid by HVZ reaction, substitution reactions of monochloroacetic acid by nucleophiles CN^-, OH^-, I^-, and NH_3. **6.2.** Hydroxyacids : Malic acid and citric acid, Methods of formation of malic acid from acid and moist Ag_2O. Reactions of malic acid – action of heat, oxidation reaction and reaction with HI, uses of malic acid. Methods of formation of citric acid from glycerol. Reactions of citric acid. Acetylation with acetic anhydride reduction by HI, Action of heat at 422^0K. Uses of citric acid. **6.3.** Unsaturated acids : Methods of formation of acrylic acid from acrolein and by dehydration of _-hydroxyl	**To study** **6.1.** Monocarboxylic acids : Introduction. Methods of formation of Halo acids, di- and trichloroacetic acid by HVZ reaction, substitution reactions of monochloroacetic acid by nucleophiles CN^-, OH^-, I^-, and NH_3. **6.2.** Hydroxyacids : Malic acid and citric acid, Methods of formation of malic acid from acid and moist Ag_2O. Reactions of malic acid – action of heat, oxidation reaction and reaction with HI, uses of malic acid. Methods of formation of citric acid from glycerol. Reactions of citric acid. Acetylation with acetic anhydride reduction by HI, Action of heat at 422^0K. Uses of citric acid. **6.3.** Unsaturated acids : Methods of formation of acrylic acid from acrolein and by dehydration of _-hydroxyl	**Students gain an understanding of :** Monocarboxylic acids : Introduction. Methods of formation of Halo acids, di- and trichloroacetic acid by HVZ reaction, substitution reactions of monochloroacetic acid by nucleophiles CN^-, OH^-, I^-, and NH_3. Hydroxyacids : Malic acid and citric acid, Methods of formation of malic acid from acid and moist Ag_2O. Reactions of malic acid – action of heat, oxidation reaction and reaction with HI, uses of malic acid. Methods of formation of citric acid from glycerol. Reactions of citric acid. Acetylation with acetic anhydride reduction by HI, Action of heat at 422^0K. Uses of citric acid. Unsaturated acids : Methods of formation of acrylic acid from acrolein and by dehydration of _-hydroxyl propionic acid. Reactions of acrylic acid – Addition of H_2O reduction by Na / C_2H_5OH. Uses of acrylic acid. Methods of formation of cinnamic acid from benzaldehyde using diethyl malonate and by using acetic anhydride and sodium acetate. Reactions of cinnamic acid – bromination, oxidation. Uses of cinnamic acid. Dicarboxylic acids : Succinic and phthalic acids. Methods of formation of succinic acid

propionic acid. Reactions of acrylic acid – Addition of H_2O reduction by Na / C_2H_5OH. Uses of acrylic acid. Methods of formation of cinnamic acid from benzaldehyde using diethyl malonate and by using acetic anhydride and sodium acetate. Reactions of cinnamic acid – bromination, oxidation. Uses of cinnamic acid. **6.4.** Dicarboxylic acids : Succinic and phthalic acids. Methods of formation of succinic acid from ethylene bromide, maleic acid. Reactions of succinic acid – action of heat, action of $NaHCO_3$, C_2H_5OH in presence of acid. Uses of succinic acid. Methods of formation of phthalic acid from o-xylene and naphthalene Reactions of phthalic acid – action of heat, reaction with sodalime, NH_3. Uses of phthalic acid.	propionic acid. Reactions of acrylic acid – Addition of H_2O reduction by Na / C_2H_5OH. Uses of acrylic acid. Methods of formation of cinnamic acid from benzaldehyde using diethyl malonate and by using acetic anhydride and sodium acetate. Reactions of cinnamic acid – bromination, oxidation. Uses of cinnamic acid. **6.4.** Dicarboxylic acids : Succinic and phthalic acids. Methods of formation of succinic acid from ethylene bromide, maleic acid. Reactions of succinic acid – action of heat, action of $NaHCO_3$, C_2H_5OH in presence of acid. Uses of succinic acid. Methods of formation of phthalic acid from o-xylene and naphthalene Reactions of phthalic acid – action of heat, reaction with sodalime, NH_3. Uses of phthalic acid.	from ethylene bromide, maleic acid. Reactions of succinic acid – action of heat, action of $NaHCO_3$, C_2H_5OH in presence of acid. Uses of succinic acid. Methods of formation of phthalic acid from o-xylene and naphthalene Reactions of phthalic acid – action of heat, reaction with sodalime, NH_3. Uses of phthalic acid.
7. Diazonium Salts (4) 7.1 Diazoniumsalts : Introduction, benzene diazonium chloride – preaparation, chemical properties. i. Formation of iodo benzene ii. Sandmeyer's reaction iii. Formation of benzene iv. Formation of phenylhydrazine v. Azo coupling – synthesis of methyl orange and congo red.	**To study** 7.1 Diazoniumsalts : Introduction, benzene diazonium chloride – preaparation, chemical properties. i. Formation of iodo benzene ii. Sandmeyer's reaction iii. Formation of benzene iv. Formation of phenylhydrazine v. Azo coupling – synthesis of methyl orange and congo red.	**Student understands the concepts** 7.1 Diazoniumsalts : Introduction, benzene diazonium chloride – preaparation, chemical properties. i. Formation of iodo benzene ii. Sandmeyer's reaction iii. Formation of benzene iv. Formation of phenylhydrazine v. Azo coupling – synthesis of methyl orange and congo red.

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B.A. / B.Sc. / M.A. / M.Sc.	: **B.Sc. II**	
NAME OF SUBJECT	: Inorganic Chemistry	
SEM I / II / III / IV / V / VI	: **Sem. III**	
COURSE NUMBER (PAPER NUMBER)	: P -VI	
TITLE OF COURSE (NAME OF PAPER)	**: Inorganic Chemistry**	
COURSE CONTENT	**OBJECTIVES**	**OUTCOME**
1. Co-ordination Chemistry : 1.1 Definition and formation of co-ordinate covalent bond in BF_3: NH_3 and in $[NH_4]^+$. 1.2 Distinction between double salt and complex salt, 1.3 Werner's theory : A. Postulates of theory, B. Applications of theory: Theory applied to cobalt amine viz; a].$CoCl_3.6NH_3$ b] $CoCl_3.5NH_3$, c] $CoCl_3.4NH_3$, d] $CoCl_3.3NH_3$ C. Limitations 1.4 Description of terms –a] ligand, b]co-ordination number, c] co-ordination sphere, d]effective atomic number, e] Geometrical isomerism and optical isomerism in co-ordination compounds for CN = 4 and CN = 6. 1.5 IUPAC nomenclature of co-ordination compounds, 1.6 Valence bond theory of transition metal complexes. A .Introduction B. Postulates of VBT/ basic concepts of VBT C. Role of transition metal in the formation of complex D. Stepwise process of formation of	Students should get knowledge about; 1) Coordinate bond and their mechanism of formation. 2) Werner's and VBT approach for the bonding and characteristics of coordinate bond. 3) Isomerism and IUPAC nomenclature of co-ordination compounds.	Students have understood about Coordinate bonding in the complex compounds along with their Isomerism and IUPAC nomenclature.

complex : Salient features. E. Applications: High spin and low spin complexes w.r.t. CN = 4 and CN = 6. F. Limitations of Valence bond theory.		
2. Chelation 2.1 A brief introduction w.r.t. ligand, chelating agent, chelation and metal chelate. 2.2 Structural requirements of chelate formation. 2.3 Difference between metal chelate and metal complex. 2.4 Classification of chelating agents (with specific illustrations of bidentate chelating agent). 2.5 Applications of chelation w.r.t. chelating agents : EDTA and DMG.	Students should get knowledge about application of coordination chemistry as a chelating agents and metal chelate.	Students have understood about difference between metal complex and metal chelate. Also they understood the applications of chelating agents in our life.
3. Acids and Bases 3.1 Lewis Concept : A.Definition, B.classification,C. merits and D.demerits. 3.2 Hard and soft acids and bases (HSAB) : A. Classification of acids and bases as hard and soft, B. Pearson's HSAB concept, C. Acid-Base strength and hardness-softness, D. Applications and limitations of HSAB principle.	1. To develop the thinking of students for acid base concept. 2. To understand various concepts of acids and bases. 3. To help student to classify Hard and soft acids and bases	1. Students are able to distinguish between various examples. 2. Students are able to apply knowledge in various content.
4. Study of d-block elements 4.1. Introduction, 4.2. Position of d-block elements in periodic table, 4.3.Names& electronic configuration of 1st, 2nd & 3rd three transition series. 4.4. General Characteristics of 3 d-block elements w.r.t. – a) oxidation state b) colour c) Magenetic behavior (spin only formula)	1. Enable students to distinguish between properties s-block, p-block and d-block element 2. To help the students to understand properties of d-block element 3. To help the students to understand electronic configuration, name symbol atomic number of 1^{st} ,2^{nd},3^{rd} transition series elements	1. Students are able to distinguish between properties of s-block, p-block and d- block element 2. Students are able to give properties of d-block element 3. Students are able to give electronic configuration, atomic number , symbol and name of the three transition series element

d) catalytic properties and e) tendency to form complexes. 4.5. Comparison of 1st transition series with 2nd & 3rd transition series w.r.t. – a) electronic configuration b) reactivity c) stability of oxidation state d) magnetic behavior and e) stability of complexes (Brief account only)	4. To help the students to understand various properties of 3-d transition series element 5. To help the students to compare properties of three transition series.	4. Students are able to understand the characteristics of various properties of 3-d block element and students can apply those characters in various concept related to 3-d series elements such as co-ordination chemistry; chelation; acid base concept also in research as studies in metal complexes.

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B.Sc. II		
NAME OF SUBJECT: Physical Chemistry		
SEM IV		
COURSE NUMBER (PAPER NUMBER) P-VII		
TITLE OF COURSE (NAME OF PAPER): Physical Chemistry		
COURSE CONTENT	**OBJECTIVES**	
Electrochemistry 1.1. Introduction, conduction of electricity, Types of conductors :	To study 1.1. conduction of electricity, Types of conductors : electronic and electrolytic.	**Students gain in u** 1.1. Conduction o conductors : electr

electronic and electrolytic. 1.2. Explanation of terms : Conductance, Specific resistance, specific conductance, Equivalent conductance, Molecular conductance. 1.3. Variation of specific and equivalent conductance with concentration, Equivalent conductance at infinite dilution. (Mention Onsager equation, $b\ c\ v = -\infty\ \lambda\ \lambda$from graph) 1.4. Migration of ions, Hittorf's rule, Transport number, Determination of transport number by moving boundary method, factors influencing transport number: Nature of electrolyte, concentration, temperature, complex formation and Degree of hydration. 1.5. Kohlrausch law, Applications of Kohlrausch law : i. Determination of relationship between ionic conductance, ionic mobility and transport number. ii. Determination of equivalent conductance at infinite dilution of weak electrolytes. iii. Determination of degree of dissociation of weak electrolyte. iv. Determination of ionic product of water. v. Determination of solubility of sparingly soluble salts. 1.6. Numerical problems.	1.2. Explanation of terms : Conductance, Specific resistance, specific conductance, Equivalent conductance, Molecular conductance. 1.3. Variation of specific and equivalent conductance with concentration, Equivalent conductance at infinite dilution. (Mention Onsager equation, $b\ c\ v = -\infty\ \lambda\ \lambda$from graph) 1.4. Migration of ions, Hittorf's rule, Transport number, Determination of transport number by moving boundary method, factors influencing transport number: Nature of electrolyte, concentration, temperature, complex formation and Degree of hydration. 1.5. Kohlrausch law, Applications of Kohlrausch law : i. Determination of relationship between ionic conductance, ionic mobility and transport number. ii. Determination of equivalent conductance at infinite dilution of weak electrolytes. iii. Determination of degree of dissociation of weak electrolyte. iv. Determination of ionic product of water. v. Determination of solubility of sparingly soluble salts. **To solve** 1.6. Numerical problems.	1.2. Explanation o resistance, specific conductance, Molecular conduct 1.3. Variation of sp conductance with conductance at infi dilution. (Mention λfrom graph) 1.4. Migration of i number, Determina moving boundary method, factors inf Nature of electroly complex formation and Deg 1.5. Kohlrausch la law : i. Determination o conductance, ionic ii. Determination infinite dilution of iii. Determination weak electrolyte. iv. Determination v. Determination o salts. Student becomes a problems based on
2. Thermodynamics 2.1. Introduction, concept of entropy, Entropy as a state function: Definition, mathematical expression, unit, physical significance of entropy. 2.2. Entropy changes for reversible and irreversible processes in isolated systems. 2.3. Entropy changes for an ideal gas as a function of V and T and as a function of P and T. 2.4. Entropy change in mixing of gases. 2.5. Entropy change in physical transformations :	**To study** 2.1.concept of entropy, Entropy as a state function: Definition, mathematical expression, unit, physical significance of entropy. 2.2. Entropy changes for reversible and irreversible processes in isolated systems. 2.3. Entropy changes for an ideal gas as a function of V and T and as a function of P and T. 2.4. Entropy change in mixing of gases. 2.5. Entropy change in physical transformations :	**Students gain an** 2.1. concept of ent function: Definitio unit,physical signi 2.2. Entropy chang irreversible proces 2.3. Entropy chang of V and T and as P and T. 2.4. Entropy chang 2.5. Entropy chang i. Fusion of a solid ii. Vaporization of

i. Fusion of a solid. ii. Vaporization of a liquid. iii. Transition from one crystalline form to another. 2.6. Third law of thermodynamics, Absolute entropy and Evaluation of absolute entropy, use of absolute entropies: Determination of entropy changes in chemical reactions. 2.7. Numerical problems.	i. Fusion of a solid. ii. Vaporization of a liquid. iii. Transition from one crystalline form to another. 2.6. Third law of thermodynamics, Absolute entropy and Evaluation of absolute entropy, use of absolute entropies: Determination of entropy changes in chemical reactions. **To solve** 2.7. Numerical problems.	iii. Transition from 2.6. Third law of t entropy and Evalu absolute entropies: Determination of e reactions. Students gains con problems.
Physical properties of liquids 1.1 Introduction, additive and constitutive properties 1.2 **Viscosity:** coefficient of viscosity, determination of viscosity by Ostwald's Viscometer 1.3 **Surface tension:**Determination of surface tension by Drop –Weight method 1.4 **Parachor:**Macleod equation and its modification by Sugden, applications of parachor in the determination of molecular structures as benzene and NO2 group 1.5 **Dipole moment:** electrical polarization of molecules 1.6 Use of dipole moment in the study of molecular structure 1.7**Refractometery:** Refractive index, Snell's law 1.8 Specific and molecular refractivity, Abbe's refractometer: Principle-critical angle phenomenon-construction, working and advantages 1.9 Molecular refractivity and chemical constitution	To understand basic concepts of viscosity, S.T,parachore, dipole moment refractive index, etc.	Student should able course.

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B.A. / B.Sc. / M.A. / M.Sc.	: B.Sc. II
NAME OF SUBJECT	: Inorganic Chemistry

SEM I / II / III / IV / V / VI : Sem. IV		
COURSE NUMBER (PAPER NUMBER) : VIII		
TITLE OF COURSE (NAME OF PAPER) **: Analytical and Industrial Inorganic Chemistry**		
COURSE CONTENT	**OBJECTIVES**	**OUTCOME**
1. Volumetric Analysis : 1.1 Introduction, Terminology :- Titrant; Titrand, standard solution; Titration Indicator; Equivalence point; End point.Primary standard ,Secondary standard. Strength of solution, volumetric analysis & their types. 1.2 Acid Base Titration i) Introduction ii) Theory of Acid-Base indicator : A) Colour change Interval B) Theories-Ostwald's theory &Quinoid theory, iii) Neutralization curve and choice of indicator for following titrations : A) Strong acid and Strong Base B) Strong Acid and Weak Base C) Weak Acid and Strong Base 1.3 Complexometric titration : A) General account, B) Types of EDTA Titrations, C) Metallochromic Indicator w.r.t. Eriochrome Black-T	1. To help the students to understand various concepts of volumetric analysis 2. to help the students to understand different types of volumetric analysis 3. to help the students to understand various types of acid base reactions	1. Students are able to understand various type of volumetric analysis 2. Students are able to distinguish between types of titrations 3. Students are able to apply knowdge in various fields of chemistry
2. Gravimetric Analysis: 2.1. Introduction, Terminology :- Gravimetric analysis, Saturation, Super-saturation, Sol, Gel, Coagulation or Flocculation, Coagulation or Flocculation value, Peptisation, Precipitation, Precipitate, Precipitant, Solubility, Aging or digestion, Ignition, 2.2. General steps involved in gravimetry 2.3. Precipitation – A) Physical nature of Precipitate: Gelatinous, Curdy and Crystalline. B) Conditions of Precipitation 2.4. Process of precipitation – A) Nucleation B) Crystal growth C)	1. To enable students to understand various concept of gravimetric analysis 2. to enable students to understand steps in gravimetric analysis 3. to help the students to understand various applications of gravimetric analysis in field of chemistry	1. Students understood various concept of gravimetric analysis 2. Students understood steps of gravimetric analysis 3. Students are able to apply gravimetric analysis in various field of chemistry

Digestion 2.5. Co-precipitation and Post precipitation and their difference. 2.6. Role of Organic precipitants in gravimetric analysis, 2.7. Study of organic precipitants viz. A) DMG, B) Aluminon, C) 8-Hydroxyquinoline. 2.8. Advantages and disadvantages of organic precipitants.		
3. Industrial heavy Chemicals: 3.1. Introduction 3.2. Physicochemical Principles & manufacture of following heavy chemicals: i) Ammonia by Haber process ii) Sulphuric acid by contact process.	To help the students to understand heavy chemicals such as ammonia, sulphuric acid.	Students understood the concept of manufacturing of heavy chemicals.
4. Metallurgy: 4.1. Introduction: Terminology:- Metallurgy, Mineral, Ore, Gangue, Flux, Slag. 4.2. Occurrence of metals: Types of ores 4.3. Steps involved in metallurgical processes: A) Concentration of ores- I. Physical methods: a) Gravity separation method, b) Magnetic separation method, c) Froth flotation process. II. Chemical Methods: a) Calcination b) Roasting B) Reduction- i) Chemical methods of reduction ii) Electrolytic reduction method for e.g. Aluminium and copper	Students should get knowledge about; The concept of Metallurgy, occurrence of metals and their separation methods.	Students understood the existence of metallic elements and the types of their compounds in the nature. They also learn the principle and methodology of separation techniques of metals.
5. Iron and Steel: 5.1 Occurrence of Iron 5.2 Extraction of Iron: Blast furnace 5.3 Types of Iron 5.4 Steel- A) Definition B) Types of Steel C) Manufacture of Steel: a) Bessemer process b) L. D. process	Students should get knowledge about; Chemistry of iron and their compound.	Students understood the occurrence of iron, their separation from source and preparation of steel from cast iron.

D) Heat treatment on Steel		

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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

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 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.

[07]

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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D.B.F. Dayanand College of Arts and Science, Solapur
COURSE OUTCOME
Name of the Department – CHEMISTRY

B.Sc. II		
NAME OF THE SUBJECT- BIOCHEMISTRY		
SEM- III (CBCS)		
COURSE NUMBER (PAPER NUMBER) - I		
TITLE OF COURSE (NAME OF PAPER)-BIOMOLECULES		
COURSE CONTENT	**OBJECTIVES**	**OUTCOME**
1. <u>Carbohydrates</u> – **•Definition, classification, structures & role of-** **• Monosaccharides- aldoses & ketoses.** **i) Trioses- glyceraldehyde & dihydroxy acetone.** **ii) Tetroses- erythrose, erythrulose.** **iii) Pentoses- ribose, ribulose, xylose, xylulose** **iv) Hexoses-0 glucose, mannose, Galactose, fructose.** **•Reactions of monosaccharides, reducing properties(Fehling test) oxidation, reduction, osazone formation.** **A) Oligosaccharides- glycoside bond, maltose, isomaltose, lactose, sucrose, cellobiose, their hydrolysis.** **B) Polysaccharides- Starch, glycogen, cellulose.** **C) Derived monosaccharides- Deoxy sugars (β D2 deoxy ribose), sugar acid (L-ascorbic acid), amino sugars (β D glucosamine, β D galactosamine, N-acetyl glucosamine).**	•To make students understand the importance of carbohydrates as structural and functional elements in various biochemical reactions. •To make students learn properties and structural aspects of carbohydrates and their important biological role in metabolism.	•Students were able to explain the fundamental structure and properties of carbohydrates. •Students were able to differentiate between monomeric and polymeric nature of sugar molecules. •Students understood the basic role of carbohydrates in metabolism of living organisms.

2. <u>Amino acids and Proteins</u> **A) Amino acids- meaning, definition, structure & classification of amino acids. Behaviour of Glycine, aspartic acid & lycine in neutral, acidic & basic solutions, zwitterions, pI, ninhydrin reaction.** **B) Proteins- Formation of peptide bond, definition of proteins.** **a) simple proteins (albumin globulin)** **b) complex proteins** **c) Derived proteins** **Structure levels of proteins-** **a) Primary structure (oxitocin)** **b) Secondary structure (α helix & β pleated)** **c) Tertiary structure (myoglobin)** **d) Quaternary structure (haemoglobin), Forces involved in stabilizing native structure of protein.** **Enzymes- Definitiopn, prosthetic group, cofactor, classification of enzymes with two examples of each class. IUB nomenclature and numbering of enzymes.**	•To make students understand the importance of proteins as structural and functional elements in various biochemical reactions. • To make students learn properties and structural aspects of proteins, forces involved in their stabilization and their important role in metabolism.	• Students understood the fundamental classification and properties of proteins. • Students were able to explain structural organization and forces involved in stabilization of protein structure. •Student understood the basic role of protein in living organisms. •Students were able to explain the basic role of enzymes as catalysts in metabolism of living organisms.
3. <u>Nucleic Acids</u>- **Meaning, distinction between DNA & RNA. Components of nucleic acids- nucleosides bases, sugars, phosphoric acid- nucleosides & nucleotides phosphodiester linkage, representation of primary structure of polynucleotide. Watson-Crick model of DNA. Structure and function t-RNA and r-RNA.**	To make student understand • Structure of nitrogenous bases, nucleosides, nucleotides. •How nucleotides join to form a DNA or RNA strand. •3D structure of DNA and structure of different RNAs and their biological role.	•Students were able to explain the structure of nitrogenous bases nucleosides and nucleotides. •Students understood the phosphodiester linkage. •Students were able to explain Watson-Crick model of DNA and its biological importance. • Student understood the structure and function of different RNA. • Student were able to differentiate between DNA & RNA.

4. <u>Vitamins</u> **Definition, differences between fat soluble and water soluble vitamins. Source, requirement, biochemical role & deficiency disorders of vitamins- retinol, thiamine, niacin, pyridoxine & Pantothenic acid, their coenzyme forms.**	To make students understand- •Types of Vitamins • Structure of Vitamins and their coenzyme form. • Amount of vitamin needed by body. •Dietary sources of different vitamins. •Biological role of these vitamins in metabolism and other processes. •Symptoms or diseases causes of these vitamins.	•Students were able to differentiate fat and water soluble vitamins. • Students were able to explain the structure of vitamins and their coenzyme forms. •Students understood the importance of vitamins for normal functioning of body and biological role of individual vitamins. •Students were able to explain the deficiency symptoms of each vitamin.
5. <u>Lipids</u> **Definition and classification with two examples of each class. Structure & function of-** **a) Simple lipids- fatty acids & triglycerides.** **b) Compound lipids-phospholipids, spingolipids, glycolipids.** **c) Derived lipoids- steroids (cholesterol), terpenes, carotenes.**	To make students understand- •Meaning of term l ipids. •Biological importance of lipids. •Types of fatty acids (building blocks of lipids). • Classification, structure and functions of different lipids. • Fluid mosaic model of cell membrane.	• Students were able to define lipids. •Students were able to classify lipids and explain their structure and biological function . • Students understood the structure and organization of cell membrane.

B.Sc. II
NAME OF THE SUBJECT- BIOCHEMISTRY

SEM- III (CBCS)		
COURSE NUMBER (PAPER NUMBER) - II		
TITLE OF COURSE (NAME OF PAPER)-BIOCHEMICAL TECHNIQUES		
COURSE CONTENT	**OBJECTIVES**	**OUTCOME**
1. **Chromatography** Definition & classification, principle, technique & applications of i) Thin layer chromatography ii) Gel permeation chromatography iii) High pressure liquid chromatography Selection of gel, preparation of plate/ column packing, application of sample, mechanism of separation, important applications & advantages of the methods.	• To make students understand the working principle of chromatography technique • To make students learn working and mechanism of separation of molecules in different chromatography techniques • To make students have knowledge of applications of chromatography techniques.	• Students should understand the working principle of chromatography as a separation technique. • Students should be able to explain use of properties of molecules for their separation by chromatography. • Students should have knowledge about advantages and applications of chromatography techniques.
2. **Electrophoresis** Definition, electrophoretic mobility, factors affecting electrophoretic mobility. Principle, technique and applications of- 1) Starch gel electrophoresis 2) SDS-polyacrylamide gel electrophoresis 3) Agarose gel electrophoresis 4) 2-D gel electrophoresis Preparation of gel plates, application of sample, mechanism of separation, developing the plates, important applications and advantages of the **methods.**	To make students understand the working principle of electrophoresis. • To make students learn working of electrophoresis and mechanism of electrophoretic separation of molecules	• Students should understand the working principle of electrophoresis • should be able to explain factors affecting electrophoretic mobility of molecules. • Students should have knowledge about advantages and applications of electrophoresis

3. **Absorption Spectroscopy** Beer-Lambert's law, its mathematical derivation, meaning of the termstransmittance, absorbance, molar and specific absorbance. Construction, working and applications of photoelectric colorimeter and spectrophotometer. Limitations of colorimetric measurement. Absorption spectra of hemoglobin. Advantages of spectrophotometer over colorimeter.	• To make students understand the working principle of absorption spectroscopy. • To make students learn working of spectroscopic techniques	• Students should understand the working principle of absorption spectroscopy as an analysis technique. • should be able to explain Beer Lamberts law and the differentiate between absorbance and transmittance. • Students should be able to explain the working and use of colorimeter and spectrophotometer, their advantages and limitations.
4. **Enzyme immobilization** Definition, meaning, types of immobilizationadsorption on carriers, covalent binding to carriers, intermolecular cross-linking, entrapment within polymer gels, industrial applications of immobilization	• To make students understand concept and need of immobilization technique. • To make students learn working and types of immobilization technique.	• Students should be able to explain the use of enzyme immobilization in isolation and purification methods. • Students should have knowledge about industrial applications of immobilization.
5. **Modern Techniques** A) Blotting techniques- Western,	• To make students	• Sstudents should understand the

Southern & Northern blotting. B) Polymerase chain reaction-technique & applications. C) Enzyme linked immunosorbent assay (ELISA)- technique & applications. D) Hybridoma technology (formation of monoclonal antibodies & its significance). E) Biotechnology & intellectual property rights (IPR), patents, copyright, trade secret, and trademarks.	understand concept working mechcanism of different modern biomolecular techniques. • To make students understand the importance of IPR, patents and trademarks.	working mechanism of different modern biomolecular techniques from their application point of view. • Students should have knowledge about importance of IPR, patents and trademarks.

D.B.F. Dayanand College of Arts and Science, Solapur
COURSE OUTCOME
Name of the Department – CHEMISTRY

B.Sc. II		
NAME OF THE SUBJECT- BIOCHEMISTRY		
SEM- IV (CBCS)		
COURSE NUMBER (PAPER NUMBER) – III		
TITLE OF COURSE (NAME OF PAPER) Nutrition and Metabolism		
COURSE CONTENT	**OBJECTIVES**	**OUTCOME**
1. **Nutrition and colorimetry:** **Nutrition**-definition, balanced diet, source, requirement. Nutritional aspects of carbohydrates, proteins (biological value, essential and non-essential amino acids, nitrogen balance). Lipids (essential and non-essential fatty acids). A brief account of vitamins & minerals in diet. **Calorimetry**- calorific values of food and its measurement (bomb calorimeter) respiratory quotient, basal	• Students Know about **Nutrition**-definition, balanced diet, source, requirement. Nutritional aspects of carbohydrates, proteins (biological value, essential and non-essential amino acids, nitrogen balance). Lipids (essential and non-essential fatty acids). A brief account of vitamins & minerals in diet. **Calorimetry**- calorific values of food and its measurement (bomb calorimeter) respiratory quotient, basal metabolic rate (BMR),	•Students were able to identify **Nutrition**-definition, balanced diet, source, requirement. Nutritional aspects of carbohydrates, proteins (biological value, essential and non-essential amino acids, nitrogen balance). Lipids (essential and non-essential fatty acids). A brief account of vitamins & minerals in diet. •Students understood the **Calorimetry**- calorific values of food and its

metabolic rate (BMR), measurement of BMR (Douglas bag method). Factors effecting BMR and its significance.	measurement of BMR (Douglas bag method). Factors effecting BMR and its significance	measurement (bomb calorimeter) respiratory quotient, basal metabolic rate (BMR), measurement of BMR (Douglas bag method). Factors effecting BMR and its significance.
2. Biological oxidation: Bioenergetics-Exergonic and endergonic reactions, free energy, high energy compounds and their significance, ATP as a high energy compound. Mitochondrial respiration-components of respiratory chain , respiratory chain, oxidative phophorylation, mechanism of oxidative phosphorylation (Chemiosmotic coupling hypothesis), inhibitors of electron transport chain	• Students understand the Bioenergetics-Exergonic and endergonic reactions, free energy, high energy compounds and their significance, ATP as a high energy compound. Mitochondrial respiration-components of respiratory chain , respiratory chain, oxidative phophorylation, mechanism of oxidative phosphorylation (Chemiosmotic coupling hypothesis), inhibitors of electron transport chain	• Students understood the Bioenergetics-Exergonic and endergonic reactions, free energy, high energy compounds and their significance, ATP as a high energy compound. Mitochondrial respiration-components of respiratory chain , respiratory chain, oxidative phophorylation, mechanism of oxidative phosphorylation (Chemiosmotic coupling hypothesis), inhibitors of electron transport chain
3. Carbohydrate metabolism: Glycolysis & its energetic. Lactic acid and ethanol fermentation. TCA cycle and its energitics, glycogenesis and glycogenolysis.	•Students should know carbohydrate metabolism and glycolysis & its energetic. Lactic acid and ethanol fermentation. TCA cycle and its energetic, glycogenetics and glycogenolysis.	•Students learn about carbohydrate metabolism and glycolysis & its energetic. Lactic acid and ethanol fermentation. TCA cycle and its energetic, glycogenetics and glycogenolysis.

4. Amino acid metabolism: General reactions of amino acid metabolism viz. transamination, deamination, decarboxylation. Urea cycle. Inborn errors of amino acid metabolism phenylketonuria (PKU).	•To understand the Amino acid metabolism: General reactions of amino acid metabolism viz. transamination, deamination, decarboxylation. Urea cycle. Inborn errors of amino acid metabolism phenylketonuria (PKU).	•Students understood the Amino acid metabolism: General reactions of amino acid metabolism viz. transamination, deamination, decarboxylation. Urea cycle. Inborn errors of amino acid metabolism phenylketonuria (PKU).
5. Lipid metabolism: Biosynthesis of palmitic acid and its energetic, β -oxidation of palmitic acid and its energetics.	•To study the Lipid metabolism: Biosynthesis of palmitic acid and its energetic, β-oxidation of palmitic acid and its energetics.	•Students able to know Lipid metabolism: Biosynthesis of palmitic acid and its energetic, β -oxidation of palmitic acid and its energetics.
6. Electrolyte & acid base balance in body: Functions of water regulation of electrolyte balance in body, dehydration. Acid-base balance-production of acid & bases by body. Maintenance of blood pH. Blood buffers-bicarbonate, phosphate & protein buffer system in body. Respiratory mechanism of pH regulation. Renal mechanism of pH regulation CO_2 as a central molecule of pH regulation, disorders of acid-base balance.	•Students should know and aware about Functions of water, regulation of electrolyte balance in body,dehydration. Acid-base balance-production of acid & bases by body. Maintenance of blood pH. Blood buffers-bicarbonate, phosphate & protein buffer system in body. Respiratory mechanism of pH regulation. Renal mechanism of pH regulation CO_2 as a central molecule of pH regulation, disorders of acid-base balance.	•Students understood and gain the knowledge about Functions of water, regulation of electrolyte balance body, dehydration. Acid-base balance-production of acid & bases by body. Maintenance of blood pH. Blood buffers-bicarbonate, phosphate & protein buffer system in body. Respiratory mechanism of pH regulation. Renal mechanism of pH regulation CO_2 as a central molecule of pH

		regulation, disorders of acid-base balance.

D.B.F. Dayanand College of Arts and Science, Solapur
COURSE OUTCOME
Name of the Department – CHEMISTRY

B.Sc. II		
NAME OF THE SUBJECT- BIOCHEMISTRY		
SEM- IV (CBCS)		
COURSE NUMBER (PAPER NUMBER) - IV		
TITLE OF COURSE (NAME OF PAPER) Molecular Biochemistry and Diseases		
COURSE CONTENT	**OBJECTIVES**	**OUTCOME**
1. Enzymology: Enzyme as a catalyst, concept of activation energy in enzyme catalyzed reaction. Unit of enzyme activity, specific activity and turnover number. Active site of enzyme and its features. Types of enzyme specificity. Induced fit hypothesis. Factors affecting enzyme activity-pH, temperature and substrate concentration. Enzyme kinetics derivation of Michaelis-Menten equation for single substrate. Significance of Km and Vmax. Lineweaver Burk plot. Enzyme inhibition-irreversible, competitive and non competitive inhibition. Isoenzymes of LDH and their clinical importance.	• Students should Study Enzymology: Enzyme as a catalyst, concept of activation energy in enzyme catalyzed reaction. Unit of enzyme activity, Enzyme kinetics derivation of Michaelis- Menten equation for single substrate. Significance of Km and Vmax. Lineweaver Burk plot. Enzyme inhibition-irreversible, competitive and	•Students understood the Enzymology: Enzyme as a catalyst, concept of activation energy in enzyme catalyzed reaction. Unit of enzyme activity, Enzyme kinetics derivation of Michaelis- Menten equation for single substrate. Significance of Km and Vmax. Lineweaver Burk plot. Enzyme inhibition-irreversible, competitive and non competitive inhibition. Isoenzymes of LDH and their clinical

	non competitive inhibition. Isoenzymes of LDH and their clinical importance.	importance.
2. Molecular Biology and Genetic Engineering: Introduction, Replication of DNA (semi conservative), mechanism of transcription in prokaryotes. Genetic code. Translation in prokaryotes. Regulation of gene expression, constitutive & inducible genes. Operon concept, Lac operon in E. coli. restriction endonucleases, S1 nucleases, reverse transcriptase, cloning vectors-pBR322 and λ phase. Preparation of c-DNA. Gene cloning technique illustrated with insulin gene cloning. Applications of generic engineering	• Students understand the Molecular Biology and Genetic Engineering: Introduction, Replication of DNA (sem conservative), mechanism of transcription in prokaryotes. Genetic code. Translation in prokaryotes. Regulation of gene expression, constitutive & inducible genes. Operon concept, Lac operon in E. coli. restriction endonucleases, S1 nucleases, reverse transcriptase, cloning vectors-pBR322 and λ phase. Preparation of c-DNA. Gene cloning technique i llustrated with insulin gene cloning. Applications of generic engineering.	•Student understood the Molecular Biology and Genetic Engineering: Introduction, Replication of DNA (semi conservative), mechanism of transcription in prokaryotes. Genetic code. Translation in prokaryotes. Regulation of gene expression, constitutive & inducible genes. Operon concept, Lac operon in E. coli. restriction endonucleases, S1 nucleases, reverse transcriptase, cloning vectors-pBR322 and λ phase. Preparation of c-DNA. Gene cloning technique illustrated with insulin gene cloning. Applications of generic engineering.

3. Immunology: Natural & acquired immunity. Immune response to antigen. Clonal selection theory for formation of antibodies. Structure of IgG.	• To study Immunology: Natural & acquired immunity. Immune response to antigen. Clonal selection theory for formation of antibodies. Structure of IgG.	•Students gain the knowledge of Immunology: Natural & acquired immunity. Immune response to antigen. Clonal selection theory for formation of antibodies. Structure of IgG.
4. Biochemistry of diabetes mellitus: Structure of insulin, formation of insulin from preproinsulin, factors stimulating insulin secretion, metabolic effects of insulin, mechanism of action of insulin. Types of diabetes mellitus, metabolic changes in diabetes mellitus, long term effects of diabetes, Management of diabetes-dietary, hypoglycemic drugs and insulin.	• Students aware about Biochemistry of diabetes mellitus: Structure of insulin, formation of insulin from preproinsulin, factors stimulating insulin secretion, metabolic effects of insulin, mechanism of action of insulin. Types of diabetes mellitus, metabolic changes in diabetes mellitus, long term effects of diabetes, Management of diabetes-dietary, hypoglycemic drugs and insulin.	• Students know and understood Biochemistry of diabetes mellitus: Structure of insulin, formation of insulin from preproinsulin, factors stimulating insulin secretion, metabolic effects of insulin, mechanism of action of insulin. Types of diabetes mellitus, metabolic changes in diabetes mellitus, long term effects of diabetes, Management of diabetes-dietary, hypoglycemic drugs and insulin.

5. Biochemistry of cancer: Types of tumor, agents causing cancer- chemical carcinogens, radiant energy, oncogenic viruses, tumor markers-α-fetoprotein (AFP), carcinoembryogenic antigen (CEA), characteristics of tumor cells.	• Students study for Biochemistry of cancer: Types of tumor, agents causing cancer- chemical carcinogens, radiant energy, oncogenic viruses, tumor markers-α-fetoprotein (AFP), carcinoembryogenic antigen (CEA), characteristics of tumor cells.	• Students understood Biochemistry of cancer: Types of tumor, agents causing cancer- chemical carcinogens, radiant energy, oncogenic viruses, tumor markers-α- fetoprotein (AFP), carcinoembryogenic antigen (CEA), characteristics of tumor cells.
6. Biochemistry of AIDS: Structure of HIV, transmission of HIV, immunological abnormalities in AIDS. Lysis of CD4 cells. Consequences of immunodeficiency, natural course of AIDS- acute, chronic, crisis phages. Graphical representation. Anti AIDS drugs-AZT, didanosine (structure & mechanism of action).	• Students should aware about Biochemistry of AIDS: Structure of HIV, transmission of HIV, immunological abnormalities in AIDS. Lysis of CD4 cells. Consequences of immunodeficiency, natural course of AIDS- acute, chronic, crisis phages. Graphical representation. Anti AIDS drugs-AZT, didanosine (structure & mechanism of action)	•Students completely aware know Biochemistry of AIDS: Structure of HIV, transmission of HIV, immunological abnormalities in AIDS. Lysis of CD4 cells. Consequences of immunodeficiency, natural course of AIDS- acute, chronic, crisis phages. Graphical representation. Anti AIDS drugs-AZT, didanosine (structure & mechanism of action)

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

COURSE OUTCOME

Name of Department: Chemistry

B.Sc.II		
NAME OF SUBJECT: Geo Chemistry		
SEM III		
COURSE NUMBER (PAPER NUMBER) P-I		
TITLE OF COURSE (NAME OF PAPER): Introduction to Geo Chemistry		
COURSE CONTENT	**OBJECTIVES**	**OUTCOME**
Phase Rule Unit 1- Gibbs phase rule, one component system (water and sulphur), Goldschmidt's Mineralogical phase rule	**To study the:** Gibb's Phase Rule , One Component System-Water System , Sulphur System ,Gold smidth's Minerological Phase Rule	**Students get the Knowledge of** Gibb's Phase Rule , One Component System-Water System , Sulphur System ,Gold smidth's Minerological Phase Rule
Colloids Definition, properties of colloids like electric charges, ion exchange and stability, kinds of colloidal system, silica as chemical sediment, clay minerals as colloids; Structure and properties of important clay minerals; Classification of clay minerals	**To understand the properties of Colloidal solution** – Definition, properties of colloids like electric charges, ion exchange and stability, kinds of colloidal system, silica as chemical sediment, clay minerals as colloids; Structure and properties of important clay minerals; Classification of clay minerals	**Students should understand the properties of Colloidal solution** – Definition, properties of colloids like electric charges, ion exchange and stability, kinds of colloidal system, silica as chemical sediment, clay minerals as colloids; Structure and properties of important clay minerals; Classification of clay minerals

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

COURSE OUTCOME

Name of Department: Chemistry

B.Sc.II		
NAME OF SUBJECT: Geo Chemistry		
SEM IV		
COURSE NUMBER (PAPER NUMBER) P-III		
TITLE OF COURSE (NAME OF PAPER): Principals of Geo Chemistry		
COURSE CONTENT	**OBJECTIVES**	**OUTCOME**
Chemical Equilibrium The law of mass action, an example of equilibrium, hydrogen chloride, the effect of temperature, other examples as CO_2 in water and calcium sulphate. Le chateliar's rule, stability, conventions of chemical equilibrium	**To study the basic concept of** The law of mass action, an example of equilibrium, hydrogen chloride, the effect of temperature, other examples as CO_2 in water and calcium sulphate. Le chateliar's rule, stability, conventions of chemical equilibrium	**Students get the Knowledge of** The law of mass action, an example of equilibrium, hydrogen chloride, the effect of temperature, other examples as CO_2 in water and calcium sulphate. Le chateliar's rule, stability, conventions of chemical equilibrium
Acids and Bases Chemical definition, Geologic usage, pH, Hydrolysis of Na_2CO_3; Estimating ionic concentration, carbonate	**To study the basic concepts of** Chemical definition, Geologic usage, pH, Hydrolysis of Na_2CO_3; Estimating ionic concentration, carbonate	**Students should understand the basic concepts of** Chemical definition, Geologic usage, pH, Hydrolysis of Na_2CO_3;

equilibrium. Temperature changes; Changes in pressure & organic activity.	equilibrium. Temperature changes; Changes in pressure & organic activity.	Estimating ionic concentration, carbonate equilibrium. Temperature changes; Changes in pressure & organic activity.

Signature of HOD

COURSE OUTCOME

Name of Department: Chemistry

B. Sc III		
NAME OF SUBJECT: Physical Chemistry		
SEM VI		
COURSE NUMBER (PAPER NUMBER) XIII		
TITLE OF COURSE (NAME OF PAPER): Physical Chemistry		
COURSE CONTENT	**OBJECTIVES**	**OUTCOME**
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) 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.	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. (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.	**Students will gain the understanding of** the basic concept of Normality, Molarity, Molality, Mole fraction, Raoult's law,Applications of Raoult's law 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) 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.	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) 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.

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

COURSE OUTCOME

Name of Department: Chemistry

M.Sc.I		
NAME OF SUBJECT: Physical Chemistry		
SEM II		
COURSE NUMBER (PAPER NUMBER) SCT – 203A		
TITLE OF COURSE (NAME OF PAPER): Physical Chemistry II		
COURSE CONTENT	**OBJECTIVES**	**OUTCOME**
Photochemistry Introduction, Absorption of light and nature of absorption spectra, electronic transitions, Franck–Condon principle, electronic excitation, photodissociation and Predissocition, photoreduction, photooxidation, photochemistry in environment (Green house effect, ozone depletion).	**To know the basic concept of** Introduction, Absorption of light and nature of absorption spectra, electronic transitions, Franck–Condon principle, electronic excitation, photodissociation and Predissocition, photoreduction, photooxidation, photochemistry in environment (Green house effect, ozone depletion).	**Students should know the basic concept of** Introduction, Absorption of light and nature of absorption spectra, electronic transitions, Franck–Condon principle, electronic excitation, photodissociation and Predissocition, photoreduction, photooxidation, photochemistry in environment (Green house effect, ozone depletion).

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COURSE OUTCOME

Name of Department: Chemistry

M.Sc.II		
NAME OF SUBJECT: Physical Chemistry		
SEM III		
COURSE NUMBER (PAPER NUMBER) PCH –303		
TITLE OF COURSE (NAME OF PAPER): Molecular structure-I		
COURSE CONTENT	**OBJECTIVES**	**OUTCOME**
Introduction of Molecular spectro scopy and Rotational Spectra Characterization of electromagnetic radiation. The quantification of energy, Regions of Spectrum, transition probability, the width and intensity of spectral transitions. Classification of molecules according to their moment of inertia. Rotational spectra of rigid and non-rigid diatomic molecules. Selection rules. The intensities of spectral lines. The effect of	**To Review of the knowledge of spectrroctry,** Characterization of electromagnetic radiation. The quantification of energy, Regions of Spectrum, transition probability, the width and intensity of spectral transitions. Classification of molecules according to their moment of inertia. Rotational spectra of rigid and non-rigid diatomic molecules. Selection rules. The intensities of spectral lines. The effect of isotopic substitution. Polyatomic molecules. The Stark	**Students should review of the knowledge of spectrroctry**, Characterization of electromagnetic radiation. The quantification of energy, Regions of Spectrum, transition probability, the width and intensity of spectral transitions. Classification of molecules according to their moment of inertia. Rotational spectra of rigid and non-rigid diatomic molecules. Selection rules. The intensities of spectral lines. The effect of isotopic substitution. Polyatomic molecules. The Stark effect. Calculations of rotational constant B for real spectrum eg CO, HCl, NO etc.

isotopic substitution. Polyatomic molecules. The Stark effect. Calculations of rotational constant B for real spectrum eg CO, HCl, NO etc. Instrumentation, source, waveguide and detectors	effect. Calculations of rotational constant B for real spectrum eg CO, HCl, NO etc. Instrumentation, source, waveguide and detectors	Instrumentation, source, waveguide and detectors

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COURSE OUTCOME

Name of Department: Chemistry

M.Sc.II		
NAME OF SUBJECT: Physical Chemistry		
SEM IV		
COURSE NUMBER (PAPER NUMBER) 403		
TITLE OF COURSE (NAME OF PAPER): Molecular structure-II		
COURSE CONTENT	**OBJECTIVES**	**OUTCOME**
Electrical Properties of Molecules Electric dipole moment of molecule, polarization of a dielectric, polarizability of molecules, Clausius-Mossotti equation. Debye equation, Limitation of the Debye theory, determination of dipole moment from dielectric measurements in pure liquids and in solutions. Dipole moment and ionic character, Bond moment, Group moment, vector addition of moments, bond angles, the energies due to dipole-dipole, dipole-induced dipole and induced dipole-induced dipole interaction. Lennard-Jones potential.	**To Review of the knowledge of** Electric dipole moment of molecule, polarization of a dielectric, polarizability of molecules, Clausius-Mossotti equation. Debye equation, Limitation of the Debye theory, determination of dipole moment from dielectric measurements in pure liquids and in solutions. Dipole moment and ionic character, Bond moment, Group moment, vector addition of moments, bond angles, the energies due to dipole-dipole, dipole-induced dipole and induced dipole-induced dipole interaction. Lennard-Jones potential.	**Students should understand**. Electric dipole moment of molecule, polarization of a dielectric, polarizability of molecules, Clausius-Mossotti equation. Debye equation, Limitation of the Debye theory, determination of dipole moment from dielectric measurements in pure liquids and in solutions. Dipole moment and ionic character, Bond moment, Group moment, vector addition of moments, bond angles, the energies due to dipole-dipole, dipole-induced dipole and i interaction. Lennard-Jones
The Magnetic properties of Molecules: Diamagnetism and paramagnetism. Volume and mass susceptibilities.	**To Review of the knowledge of** Diamagnetism and paramagnetism. Volume and mass susceptibilities. Lengevins classical	**Students should understand** Diamagnetism and paramagnetism. Volume and mass susceptibilities. Lengevins classical

Lengevins classical theory of diamagnetism and paramangenetism. Atomic and ionic susceptibility. Pascal constants, Curie- Weiss law. Van Vleck general equation of magnetic susceptibility. Determination of magnetic susceptibility, Gouy method. Ferro and ferri magnetism, application to coordination complexes and complex ions of transition metals.	theory of diamagnetism and paramangenetism. Atomic and ionic susceptibility. Pascal constants, Curie- Weiss law. Van Vleck general equation of magnetic susceptibility. Determination of magnetic susceptibility, Gouy method. Ferro and ferri magnetism, application to coordination complexes and complex ions of transition metals.	theory of diamagnetism and paramangenetism. Atomic and ionic susceptibility. Pascal constants, Curie- Weiss law. Van Vleck general equation of magnetic susceptibility. Determination of magnetic susceptibility, Gouy method. Ferro and ferri magnetism, application to coordination complexes and complex ions of transition metals.

Signature of HOD