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)

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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.)

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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	

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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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