

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
ANANTAPUR**

**Course Structure and Syllabi for Pre Ph.D
CHEMISTRY (2009-10)**

PART I

S.NO	PAPER	PAPER CODE
1	Advanced Instrumental Methods for Chemical Characterization and Analysis	09PH51101

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PART II

Choose any one subject of the following

S.NO	PAPER	PAPER CODE
1.	Analytical Chemistry	09PH51201
2.	Chemistry of Life	09PH51202
3.	Inorganic Chemistry	09PH51203
4.	Organic Chemistry	09PH51204
5.	Heterocyclics And Natural Products	09PH51205
6.	Physical Chemistry	09PH51206
7.	Environmental Chemistry	09PH51207

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
ANANTAPUR
Pre-Ph.D - CHEMISTRY

**(09PH51101) ADVANCED INSTRUMENTAL METHODS FOR CHEMICAL
CHARACTERIZATION AND ANALYSIS**

Unit-1: UV-Visible Spectroscopy:

Introduction; Absorption Laws; Theory of Electronic Spectroscopy; Types of Electronic Transitions; Chromophore concept; Auxochrome; Solvent effect; Instrumentation; Woodward – Fischer rules for calculating absorption maxima in dienes and α,β -unsaturated carbonyl compounds; Steric hindrances and co-planarity; Estimation of ligand-metal ratio in complexes; Applications.

Unit-2: Chromatographic Techniques:

Gas Chromatography; HPLC: Introduction basic principle and instrumentation; comparison of GC and HPLC; Qualitative analysis, Quantitative analysis and Applications.

Unit-3: Atomic Absorption Spectroscopy:

Introduction and importance; principles and instrumentation; Interferences - Chemical & Spectral and evaluation methods; Applications of Atomic Absorption Spectroscopy for qualitative and quantitative analysis.

Unit-4: Atomic Emission Spectroscopy:

Flame photometry; emission spectrography and ICP-AES-Principles and instrumentation; evaluation methods and applications.

Unit-5: Polarography & Cyclic voltametry:

Introduction; Polarographic wave; diffusing cyclic; Half wave potential; effect of complex formation/ current, Quantitative analysis; Qualitative analysis; Inorganic and Organic applications.

Cyclic Voltammetry: Reversible and irreversible process; evaluation of number of electrons in a chemical reaction. application to Diphenyl fulvene.

Unit-6: Nuclear magnetic resonance spectroscopy:

High resolution NMR – chemical shift- Spin decoupling ; spin tickling, shift reagents; structure determination, hydrogen bonding; geometrical isomerism and applications of proton NMR. FT-NMR.

Unit-7: IR, FT-IR and Raman spectroscopy:

Introduction; basic principles; Instrumentation ; Detectors, Qualitative, Quantitative analysis and Applications.

Unit-8: Mass Spectroscopy:

Introduction; basic principles, ionizing sources, types of ions, detectors and applications.

-2-

References:

1. ***“Vogel’s Text Book of Quantitative Chemical Analysis”***, by J. Mendham, R.C. Denney, J.D. Barnes and M.J.K. Thomas, Pearson Education Pvt. Ltd., New Delhi, (**6th edition**).
2. ***“Analytical Chemistry – Problems & Solutions”***, by S.M.Khopkar, New Age International Pvt. Ltd., New Delhi, (**2002**).
3. ***“Applications of Absorption Spectroscopy of Organic Compounds”*** by John R.Dyer, Prentice-Hall of India Pvt. Ltd., New Delhi (**1969**).
4. **Instrumental Methods of Analysis** by Hobart H.Willard and D.U.Merritt & J.R.J.A.Dean, C.E.S Publishers and distributors.
5. **Instrumental methods of chemical analysis** – By Scoog and West
6. **Physical chemistry and Inorganic chemistry** – By R.S.Drago.
7. **Electro organic studies** By A.J.Fry (Page No. 93-95)

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Pre-Ph.D - CHEMISTRY
(09PH51201) ANALYTICAL CHEMISTRY

Unit: 1 Solvent Extraction:

- i. Distribution constant and Distribution Ratios.
- ii. Method of extraction, treatment of extraction.
- iii. Counter current Liquid-Liquid Extraction.
- iv. Continuous Liquid-Liquid counter current extraction.
- v. Application of solvent extraction.

Unit: 2 Analysis of Ores and alloys:

Analysis of solder, Brass, Iron ore and dolomite.

Unit: 3 Treatment of analytical data:

Introduction; determinate errors, Random errors, errors in measurements, accuracy and precision, statistical treatment of data, rejections of results, significant figures, limitations of analytical methods, validation etc.,

Unit:4 Oxidation and Reduction equilibria:

Galvanic Cell, The nearest Equation, Types of Electrodes, Equilibrium constants from standard Potentials, Formal potentials and other approximations, Titration curves, Feasibility of Redox reactions, Redox indicators and its structural chemistry, Reagents used for Preliminary Redox reactions, Potassium permanganate, Cerium sulphate, potassium Dichromate, Iodine, Periodic acid, Potassium Bromate, Reducing agents, Potentiometric methods of analysis indicator Electrodes – Direct potentiometry potentiometry titration.

Unit:5 Complexometric titrations:

- i. Stability of complexes
- ii. Chelate effect
- iii. Metal ion indicators
- iv. Titrations involving multidentate ligands

Unit:6 Solubility Equilibria:

- i. Precipitation titrations
- ii. Indicators for precipitation titrations involving silver
- iii. Separation by precipitation
- iv. Factors affecting solubility

Unit:7 X-ray fluorescence:

Principle, energy dispersive X-ray fluorescence, wavelength dispersive X-ray fluorescence, X-ray photo electronic spectroscopy, chemical shift, application of XPES and XRF.

Unit:8 Thermal Analysis:

Principles, basic instrumentation and applications of TG, DTA and DSC. differential scanning calorimetry.

References:

1. **Quantitative Analysis** by Day & Underwood, Erinoice silver of India Pvt. Ltd.
2. **Fundamental of Analytical Chemistry** by S.Koog & West
3. **Instrumental Methods of Analysis** by Hobart H. Willard and D.U. Merritt & J.R.J.A. Dean, C.E.S Publishers and distributors.
4. **Text book of Quantitative Inorganic Analysis** by A.I. Vogel.
5. **Separation methods-** by M.N. Sastry
6. **Chemical methods of separation** by John.O. Dean.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
ANANTAPUR
Pre-Ph.D - CHEMISTRY

(09PH51202) CHEMISTRY OF LIFE

Unit-1: Cell Chemistry:

Introduction to cell as the basic unit of Life; Types of cells; Procaryotes and Eucaryotes – examples; Characteristics of Plant & Animal cells; Structure of Cell and its Organelles and their functions; A Chemical probe into the Cell: - Cell Walls composition - (G+) & (G-) Procaryotes, Plant and Animal cells i) Minerals ii) Carbohydrates iii) Proteins iv) Lipids v) Nucleic acids vi) Enzymes vii) Vitamins viii) Hormones, etc. their biological functions.

Unit-2: Lipids and Membranes:

Introduction: Lipid Structure - Acyl glycerol, Phospho glycerides (Phospholipids), ether lipids and sphingolipids. Bio-synthesis of lipids. Biological membranes – their role, structural complexity and compositions; Plasma membrane, Membrane lipids, Membrane proteins; Lipid bilayers, Fluid Mosaic Model of biological membrane. Dynamic nature of lipid bilayers and membrane. Protein and Glycoprotein components of membrane. Membrane transport pores and channels, active transport and passive transport.

Unit-3: Enzymes:

Definition, classification and nomenclature; Factors affecting the enzyme catalysed reactions. Advantages and limitations of enzymes in organic synthesis – mechanistic aspects of enzyme catalysis – Lock and Key mechanism, Induced – Fit mechanism, Desolvation and Solvation – substitution theory, Three- point attachment rule. Factors affecting the enzyme catalysed reactions. Enzyme selectivity – chemo, regio, diastereo and enatio selectivity – illustration with suitable examples. Regulation of enzyme activity – Allosteric enzymes. Enzyme inhibition – reversible inhibition – competitive, non-competitive and uncompetitive inhibition of enzymes. Immobilised enzymes – immobilization by physical and chemical methods. Co-Enzymes involved in Oxidation-Reduction processes. Role of metal ions in biological processes, physiology of digestion.

Unit-4: Bio-Chemistry of Carbohydrates:

Classification of Carbohydrates; Stereoisomerism; Optical isomerism; Optical activity projection and perspective formulas; D-glyceride as a reference compound; Cyanohydrin synthesis; Structure of glucose; monosaccharides, disaccharides and polysaccharides; Polysaccharides and Glycoproteins in cells.

Unit-5: Catabolic and Anabolic processes:

Energy transfer processes, role and significance of ATP; The electron transport system - Oxidative phosphorylation; Photosynthesis and its mechanism (cyclic and non-cyclic).

Unit-6: Respiration and Carbohydrate Metabolism:

Glycolysis and Krebs's Cycle; Physiology of respiration in mammals, respiratory exchange and transport of respiration at cellular level. Interconversion of glycogen and glucose in liver and the role of insulin.

Unit-7: Chemistry and Bio-Chemistry of Amino Acids & Proteins:

General properties of Amino acids; Proteins - Classification and Function; Structure of Proteins – Primary, Secondary, Tertiary and Quaternary Structure of Proteins. Synthesis of Peptides and Poly Peptides. Determination of Structure of Poly Peptides -N-terminal and C- terminal residue analysis.

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Unit-8: Bio-Chemistry of Nucleic Acids:

Introduction; Hydrolysis of Nucleic acids; Structure, Physical and Chemical properties of Heterocyclic bases - Adenine, Guanine, Uracil and Thymine; Structure of DNA: Primary, Secondary, Tertiary structures of DNA. A,B,C and Z forms of DNA. Structure of RNA – types of RNA – mRNA, rRNA and tRNA.; Definition and explanation of Replication, Transcription, Translation. Genetic Code – Codons – Protein synthesis.

References:

1. **“Outlines of Bio-Chemistry”**, by E.E. Conn & Stumpf, John Wiley & Sons, New York, (2000).
2. **“Text Book of Bio-Chemistry”**, by West, Todd et.al..
3. **“Priciples of Bio-Chemistry”** by White, Handler, Smith et.al.
4. **“Bio-Chemistry”**, by Lehninger
5. **“ Bio-Chemistry”** by L.Stryer and W.H.Freeman.
6. **“Organic Chemistry”**, by R.T.Morison and R.N.Boyd, Allyn & Bacon Inc., (printed in Singapore) (2001).

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Pre-Ph.D - CHEMISTRY

(09PH51203) INORGANIC CHEMISTRY

Unit-1: Organometallic Compounds :

Classification of Organometallics based on hapticity; Classification of Organometallics based on Polarity; σ bonded organometallics and π bonded organometallics; General methods for the preparation of Main-group and Transition metal organometallics.

Nature of M-C bond; Synthesis, Bonding and Uses of Organometallics of bonded organic ligands; Two electron ligands (Olefinic & Acetylenic complexes); Three electron ligands (Allylic complexes); Four electron ligand (Butadiene and Cyclobutadiene complexes); Five electron ligand (Ferrocene complex).

Unit-2: Inorganic Reaction Mechanisms:

Substitution Reactions: SN_1 & SN_2 with respect to Octahedral, Square Planar Complexes;

Redox reactions or Electron Transfer Reactions: Inner Sphere and Outer Sphere

Mechanism in Octahedral & Tetrahedral Complexes; Fluxionality: Molecular non-rigidity of Complexes; Nephelauxetic or Cloud Expanding Effect in Transition Metal Complexes; Trans-Effect; Trans-Effect Series; Uses of Trans-Effect; Theories of Trans-Effect.

Unit-3: Bonding involving π -donor ligands:

Concept of back-bonding; Transition metal to Carbon multiple bonded compounds (Carbenes & Carbynes); Metal Carbonyls; Uses of Transition Metal Organometallics; Homogeneous and Heterogeneous Catalysis; Hydroboration; Hydroformylation; Hydrogenation; Isomerization; Polymerization with Tolman Catalytic loops.

Unit-4: Symmetry of Molecules:

Concept of Symmetry in Chemistry; Symmetry Operations; Symmetry elements; Properties of a Group; Abelian and Non-Abelian groups; Molecular Point Groups; Group Multiplication Tables; Great Orthogonality Theorem and its applications.

Unit-5: Reactions in Non-aqueous Media – I:

Classification of Solvents – General Properties of Ionizing solvents – Liquid Ammonia as solvent (advantages, disadvantages, chemical properties); H_2SO_4 as solvent (chemical properties); BrF_3 and N_2O_4 as solvents (auto-ionization reactions, chemical reactions involving them); Reactions in Molten Salts.

Unit-6: Reactions in Non-aqueous Media – II:

Reactions in Solvents of high dielectric constant such as ethanol, acetic acid, pyridine etc.; Reactions in solvents like DMF, CH_3CN , DMSO etc.; Solubilization of salts either alone or in the presence of PTC etc.

UNIT –7: Co-ordination chemistry: Theory and structure:

Valence Bond theory-Crystal field theory-Molecular orbital theory- π Bonding and molecular orbital theory - Measurement of π Bonding effects - Summary of Molecular orbital theory - A closer look at spectra (Orgel diagrams, Tanabe-sugano diagrams) of d^1 - d^9 ions. Magnetic properties of first row transition metal ions.

UNIT –8: Bioinorganic chemistry:

Metal ions in Biology, Molecular mechanism of ion transport across membranes; ionophores, photosynthesis, PSL, PSH; nitrogen fixation, oxygen uptake proteins, cytochromes and ferredoxins.

References:

1. **“Organometallic Chemistry”**, by R.C. Mehrotra & A. Singh, 2nd Edition, New Age International (P) Limited, New Delhi (2000).
2. **Advances in inorganic Chemistry by** F.A.Cotton and Wilkinson :1989.
3. **Inorganic chemistry by** J.E.Huheey 1983
4. **Chemical Elements** By Greenwood: 1984.
5. **Inorganic reaction mechanism** By Benson.
6. **Text book of Inorganic chemistry** By Katz and Purcell.
7. **Inorganic chemistry** By Atkins.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
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Pre-Ph.D - CHEMISTRY

(09PH51204)ORGANIC CHEMISTRY

UNIT-1: Stereochemistry-I (Optical Isomerism):

Optical Isomerism - Elements of symmetry and chirality – Configuration of optically active molecules - DL and RS notations - Relative and Absolute configurations- Resolution of Racemic mixtures. Cram's rule - Concept of dynamic enantiomerism.

Geometrical Isomerism:

Determination of E-Z configuration by chemical and spectral methods.

UNIT-2: Reactive Intermediates:

Classical and Non-Classical carbocations, Structure, stability, shape & Reactivity of Carbonium ions; Carbanions; use of Carbanions in synthesis; Free radicals; carbenes; nitrenes and benzyne.

UNIT-3: Study of Organic Reaction Mechanisms:

Kinetic and non-kinetic methods; Uses of isotopes; Cross-over experiments; Intermediate trapping. Kinetic versus Thermodynamic control, Linear free energy – relationships.

Unit-4: Electrophilic Aromatic Substitution:

Electrophilic aromatic substitution in activated benzene derivatives; Reimer – Tiemann reaction; Vilsmeier – Haack formylation; Houben – Hoesch reaction; Diazo – Coupling; Hofmann – Martius rearrangement.

Unit-5: Nucleophilic Aromatic Substitution:

Aryl halides; Low reactivity of aryl and vinyl halides; SN_1 , SN_2 and benzyne mechanisms; Reactivity and Orientation in nucleophilic aromatic substitution; Nucleophilic substitution – aliphatic and aromatic; Von – Richter rearrangement and Sommelet – Hauser rearrangement.

Unit-6: Addition to Carbon – Hetero atom multiple bonds – I:

Addition reactions of Carbonyl compounds like aldehydes and ketones; Addition of Oxygen nucleophiles like water, alcohols, glycol etc.; Addition of Carbon nucleophiles like cyanide and carbanion etc.; Addition of Sulphur nucleophiles like thiols and $NaHSO_3$.

Unit-7: Addition to Carbon – Hetero atom multiple bonds – II:

Addition reactions of Carbonyl compounds like aldehydes and ketones; Addition of nitrogen nucleophiles like ammonia, amine, phenyl hydrazine, 2,4-dinitrophenyl hydrazine etc.; Addition of hydride ion – Reduction of aldehydes and ketones with $NaBH_4$ and $LiAlH_4$.

Unit-8: Condensation reactions of Carbonyl compounds:

Aldol condensation; Cannizzaro reaction; Dieckmann condensation; Benzoin condensation; Reformatsky reaction; Knoevenagel condensation; Addition of Grignard reagents to aldehydes and ketones.

-2-

References:

- 1) **“Stereochemistry of Carbon Compounds”** by Ernest L.Eliel, Tata-Mc Graw Hill Co., New Delhi (1975).
- 2) **“Stereochemistry- Conformation and Mechanism”**, by P.S. Kalsi, Wiley Eastern Ltd., New Delhi, Hyd. (1991).
- 3) **“Advanced Organic Chemistry”**, by Jerry March, John Wiley & Sons, New York, London. (2001).
- 4) **“Organic Chemistry”**, by R.T.Morison and R.N.Boyd, Allyn & Bacon Inc., (printed in Singapore) (2001).
- 5) **“Organic Chemistry”**, by Paula Yurkanis Bruice, Pearson Education (Singapore) Pvt. Ltd., Delhi (2001).
- 6) **“A Guide-book to Mechanism in Organic Chemistry”**, by Peter Sykes Orient Longmans Ltd., New Delhi (1976).
- 7) **“Mechanism and Theory in Organic Chemistry”**, by T.H.Lowry and K.S. Richardson, Harper & Row Publishers, London (1988).

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
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Pre-Ph.D - CHEMISTRY

(09PH51205)HETEROCYCLICS AND NATURAL PRODUCTS

UNIT – 1: Heterocyclic Synthesis and Properties-I:

Synthesis and reactivity of furan, thiophene, pyrrole, pyridine, piperidine, quinoline, isoquinoline, and Indole, Benzofuran, Benzothiophene, Cumarin, Chromene, Carbazole and Acridine.

UNIT – 2: Heterocyclic Synthesis and Properties:

Synthesis, reactivity, aromatic characters and importance of the following heterocycles; Pyrazole, Oxazole, Thiazole, Pyridazine, Pyrimidine and Pyrazine.

UNIT – 3: Molecular Rearrangements :

Nucleophilic, electrophilic and free radical rearrangements – Wagner – Meerwein, Pinacol, Benzil-benzilic acid, Favorski, Fries, Nebe, Hofmann Curtius, Beckmann, Schmidt, Baeyer – Villiger.

UNIT –4: Named reactions:

Perkin, Stobbe, Dickmann condensations, Knoevenagel condensation, Wittig reaction, Claisen condensation, Mannich reaction, Michael condensation, Robinson annulation, Reformatsky reaction.

UNIT –5: Alkaloids

Alkaloids – source and classification, extraction and general method for determining structure. Structure elucidation of papaverine and morphine, codeine.

Unit:6 : Terpenoids

Classification, isoprene rule, special isoprene rule and structural elucidation of Santonin and Abietic acids, biogenesis of mono, di and sesqui terpenoids.

Unit 7: Steroids

Structural determination of Cholesterol, Estrone, testosterone, biogenesis of cholesterol.

Unit 8: Prostaglandins

Nomenclature, biological effects, biosynthesis, , synthesis of prostaglandins, structural elucidation of PGE-1 and E-2 only.

References:

1. **Advanced organic chemistry by** reaction mechanism and structure (McGraw Hill and Kogakush) by Jerry March.
2. **Molecular reactions and photochemistry (Prentice Hall)** by Charles Dupey and
3. O.Chapman.
4. **Organic Chemistry, 5th edition (Prentice Hall of India)** by R.T.Morrison and R.N.Boyd.
5. **Organic chemistry vol. I & II(ELBS Longmann group Ltd., London)** by I.L.Finar.
6. **Organic chemistry, 5th edition, (John Wiley and Sons, New York, 1992)** by T.W.Graham Solomons.
7. **Organic polymer chemistry** by K.J.Sanders, Whapman and Hall.
8. **Organic chemistry of synthetic high polymers** by R.W.Lenz, Interscience Publishers. New York Principles of Polymerization by G.Odion. John-Wiley, New York.

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Pre-Ph.D – CHEMISTRY

(09PH51206)PHYSICAL CHEMISTRY

Unit-1: Photochemistry:

Types of Photochemical reactions; Laws of Absorption (Grothuss-Draper law & Einstein's law); Quantum yield; Primary & Secondary Photochemical processes; Joblonski Diagram: Fluorescence, Phosphorescence, Inter-System Crossing; Internal Conversion-Vibrational Cascade and Chemiluminescence.

Kinetics of Photochemical reactions; Dissociation of HI; Reaction between Hydrogen and Chlorine; Reaction between Hydrogen and Bromine; Reaction between Hydrogen and Oxygen; Explosion limits.

Unit-2: Catalysis:

Types of Catalytic Reagents; Types of Catalysis (Homogeneous and Heterogeneous catalysis); Catalytic activity; Acidity Functions; Theory of Homogeneous catalysis; Theory of Heterogeneous catalysis (Chemical theory & Adsorption theory); Kinetics of heterogeneous reactions.

Unit-3: Enzyme Catalysis:

Specificity in Enzyme Catalyzed reactions; Michaelis- Menten mechanism; Influence of Concentration on Enzyme-Catalyzed reactions; Influence of Temperature on Enzyme Catalyzed reactions; Acid-base catalysis.

UNIT-4: Quantum Mechanics-I:

Introduction to Quantum Mechanics: Postulates of Quantum Mechanics; Schrödinger wave equation; Physical significance of wave function; Eigen values and Eigen functions; Particle in a box (one dimensional) behavior; Normalization; Orthogonality; Degeneracy.

UNIT-5: Quantum Mechanics-II:

Variation method & Perturbation theory; Applications to the Helium atom; Anti -symmetry and exclusion principle; Slater's determinantal wave functions.

Unit-6: Phase rule:

Definition of Phase rule; Terminology in Phase rule; Phase diagram of two & three component systems; Stokes and Roozboom representation for three component systems.

Unit-7: Chemical Kinetics:

Fast reactions; Rate constants of fast reactions; Their determination by Stopped flow method, Relaxation method, Flash photolysis and Nuclear Magnetic Resonance methods.

Ionic reactions; Influence of solvent on the rate of reactions (single & double sphere A.C. model); Primary salt effect; Secondary salt effect; Influence of frequency factor; Influence of ionic strength.

Unit-8: Surface Chemistry:

Adsorption; Factors influencing adsorption; Surface area and its measurements; Adsorption isotherm curves; Langmuir's adsorption isotherm- its limitations; B.E.T. Adsorption isotherm-its applications; Negative adsorption; Positive adsorption; Chemisorption; Physisorption and Determination of surface area.

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References:

1. ***“Physical Chemistry”*** by Samuel Glasstone and D. Lewis; Mc Millan India ltd. New Delhi (2nd Edition, 1984).
3. ***“Physical Chemistry”*** by Peter Atkins and J.D.Paula; ELBS, Low Price Edition (7th, Edition, 2002).
4. ***“Chemical Kinetics”*** by K.J.Laidler; Tata Mc Graw- Hill Publishing Company Ltd, New Delhi (2nd Edition, 1984).
5. ***“Principles of Physical Chemistry”*** by Maron and Prutton; Oxford and IBH Publishing Co Pvt Ltd (New Delhi) and Calcutta (4th Edition, 1966).
6. ***“Physical Chemistry through problems”*** by S.K.Dogra and S.Dogra; New Age International Pvt Ltd, New Delhi and Hyderabad (4th Edition, 1996).
7. ***“Chemical Kinetics and Catalysis”*** by G.M. Panchenkov and V.P.Lebedev. *“Foundation of Chemical Kinetics”* by E.N. Yereimin.
8. ***“Physical Chemistry”*** by Peter Atkins and J.D.Paula, 2nd Edition, Mc Millan India Ltd. New Delhi (1984).
9. ***“Quantum Chemistry”*** by A.K.Chandra, 3rd edition, Tata Mc Graw-Hill Publishing Pvt Ltd.,New Delhi (1988).
10. ***“Quantum Chemistry”*** by R.K.Prasad, 3rd edition, New Age International Publications (1997).
11. ***“Quantum Chemistry”*** by I.N. Levine, 4th edition, Prentice Hall of India Pvt Ltd (1994).

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Pre-Ph.D – CHEMISTRY

(09PH51207) ENVIRONMENTAL CHEMISTRY

Unit-1: Chemistry of Air Pollution-I:

Introduction to environmental pollution; Concept, nomenclature and segments; Composition of atmosphere; Pollution of atmosphere; Types of air pollutants; Oxides of Carbon, Sulphur, Nitrogen and Hydrocarbons etc; Effect on health and environment; Green house effect, Acid rain and Photochemical smog.

Unit-2: Chemistry of Air Pollution-II:

Effect of Ozone on Health & Environment; Chlorofluorocarbons; Effect of Gasoline on air pollution; Presence of Lead in the atmosphere; Reducing toxic emission from the fuel combustion in vehicles; Control of NO emission; Catalytic control device for automobiles.

Unit-3: Chemistry of Water Pollution:

Environmental role of water; The Hydrological cycle of water; Classification of water pollutants; Measurement of BOD, COD, TOC; Waste chemicals; Oil spills, Heavy metals; Waste water treatment - Primary, Secondary (Aerobic & Anaerobic) and Tertiary treatments.

Unit-4: Chemistry of Soil Pollution:

Soil pollution; Classification of Soil Pollutants; Source and Classification of Solid Waste; Disposal of Solid Waste on land and sea; Techniques of recycling of Solid Waste.

Unit-5: Pollutants from Industry:

Polymers and Plastics; Sugar and Distillery; Drugs and Pharmaceuticals; Paper and Pulp; Metallurgical industries; Nuclear Power Plants Chernobyl and Minimata disasters.

Unit-6: Pesticide pollution:

Classification of Pesticides; Environmental implication of Pesticides; Alternate methods of Pest Control; Control methods of Pesticide Pollution; Bhopal gas disaster.

Unit- 7: Solid waste management:

Causes, effects and control measures of Urban and Industrial waste, solid waste treatment.

Unit-8: Radioactive and noise pollution:

Causes, effects and control measures of radioactive pollution and noise pollution.

References:

1. ***“Environmental Chemistry”***, by V.P. Kudesia, Pragathi Prakashan, Meerut, **(2003)**.
2. ***“Fundamental Concepts of Environmental Chemistry”***, by G.S. Sodhi, Narosa Publishing House Pvt. Ltd., New Delhi, **(2002)**.
3. ***“A Text Book in Environmental Science”***, by V. Subramanian, Narosa Publishing House Pvt. Ltd., New Delhi, **(2002)**.
4. ***“Environmental Chemistry”***, by A.K. De, New Age International Publishers, New Delhi, **(2003)**.
5. **“Solid waste management**, by B.K. Sharma and H. Kaur, Goel Publishing House, Meerut, **(1999)**.
6. **Environmental chemistry** by Manahan.
7. **Environmental chemistry** by Moore & Moore.
8. **Solid waste treatment** by Manhan.

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