Annexure – 4

Periyar University
Salem-636011.

Periyar Institute of Distance Education (PRIDE)

B.Sc., DEGREE

BRANCH IV-CHEMISTRY

(Non-Semester Pattern)

REGULATIONS AND SYLLABUS

FOR

Students admitted during

2007-2008 and onwards

Periyar Institute of Distance Education (PRIDE)

B.Sc. DEGREE

BRANCH IV-CHEMISTRY

REGULATIONS

1. Preamble and objectives of the Course :

Chemistry is central to the current revolutions in Science. No educated person today can understand the modern world without a basic knowledge of Chemistry. The existence of a large number of chemical factories ,mines and related industries in the catchments of the University necessiates Chemistry education.

The major objectives of B.Sc. Chemistry course are

1. To impart knowledge in fundamental aspects of all branches of Chemistry.
2. To acquire basic knowledge in the specialized areas like Polymer Chemistry, Environmental Chemistry, Dye Chemistry, Pharmaceutical Chemistry etc.
3. To create manpower in Chemical industries and help their growth.
4. To prepare candidates for a career in Chemical industries.

2. Condition for Admission

A candidate who has passed the Higher Secondary Examination of Tamilnadu Higher Secondary Board or an examination of some other board accepted by the syndicate as equivalent there to with Chemistry and Physics and any one of the following subjects namely Maths, Botany, Zoology or Biology shall be eligible for admission into B.Sc., course in Chemistry.

3. Duration of the Course

The course of the Degree of Bachelor of Science shall consist of three academic years .

4. Course of study:

The course of study for the B.Sc. Degree in the BranchIV-Chemistry shall consist of the following.

i) Foundation Courses (Languages and English)

ii) Core Courses: (Major and Allied subjects)

Major : Chemistry

Allied I- Physics (Compulsory)

Allied II- Mathematics or Botany

The two allied subjects may be chosen by the students and the same must be communicated to the University.

They may also choose the allied subject of their choice in the first and second year.

5. Examinations

There shall be three examinations- one in the first year, one in the second year and one in the third year. Candidates failing in any subject / subjects will be permitted to appear for such failed subject / subjects at subsequent examinations.

The Syllabus has been divided into three parts. Examinations for I, II and III Parts will be held in April / May.

The practical examination I will be held at the end of I year. II will be held at the end of II year. III and IV will be held at the end of III year.

6. Scheme of Examination :

First Year		**Hours**	**Marks**
Tamil	Paper-I	3	100
English	Paper-I	3	100
Major Paper-I	General Chemistry-I	3	100
*Allied-I	Paper-I Physics	3	100

Major Practical-I	Inorganic Analysis & Preparation	3	100
Allied-I	Practical	3	100

Second Year		**Hours**	**Marks**
Tamil	Paper-II	3	100
English	Paper-II	3	100
Major Paper-II	General Chemistry-II	3	100
*Allied-II	Paper-I	3	100
Major Practical-II	Volumetric Estimation	3	100
Allied-II	Practical	3	100

THIRD YEAR			
Paper III	Inorganic Chemistry	3	100
Paper IV	Organic Chemistry	3	100
Paper V	Physical Chemistry	3	100
Paper VI	Analytical Chemistry	3	100
Paper VII	Application Oriented subject- Pharmaceutical, industrial and Agricultural Chemistry	3	100
Practical III	Organic analysis and Gravimetric Estimation	6	100
Practical IV	Organic preparation and Physical Chemistry Experiment	6	100
(Practical marks include 10 marks for record)			

*For allied Mathematics, the marks for theory paper is 150 and there will be no practical in second/fourth semester.

7. Passing Minimum

A candidate shall be declared to have passed the examination if he /she secures not less than 40% of the marks in each paper / practical. Candidates who do not secure the required minimum marks for a pass in a paper / practical shall be required to appear for and pass the same at a subsequent appearance.

8. Classification of successful candidates

Candidates who secure not less than 60% of the aggregate marks in Part III – Core Course (Main and Allied Subjects) shall be declared to have passed the Examination in the First Class. Candidates who secure not less than 50% of the aggregate marks in Part III core course (Main and Allied subjects) but below 60% shall be declared to have passed the examination in the Second Class. All other successful candidates shall be declared to have passed in Third class.

9. Ranking

Candidates who pass all the Examinations prescribed for the course in the first appearance only are eligible for ranking.

10.Maximum Duration for the completion of the UG Programme:

The maximum duration for the completion of the UG Programme shall not exceed six years

11. Commencement of this Regulation:

These regulations shall take effect from the academic year 2007 –2008, i.e. for students who are to be admitted to the first year of the course during the academic year 2007-2008 and thereafter.

12. Pattern of Question Paper (For Both Major & Allied)

Time : 3 Hours Maximum.-100

Marks

Part A : 10x 2 =20

(Answer all questions)

(Two questions from each unit)

Part B : 5 x 4 = 20

(Answer all questions)

(One question from each unit with internal choice)

Part C : 5 x 12 = 60

(Answer all questions)

(One question from each unit with internal choice)

B.Sc.CHEMISTRY -FIRST YEAR

PAPER – I

GENERAL CHEMISTRY – 1 (180 Hours)

UNIT-I

Atomic Structure

1.1.Fundamental particles of matter – their composition – Comparison between Rutherford's model of atom and Bohr's model-Outline of the Bohr-Sommerfeld model-its limitations-Black body radiation-Photo electric effect- de Broglie theory-Heisenberg's uncertainty principle- Quantum numbers.

Wave mechanical concept of atom – Schrodinger's wave equation (derivation not needed)-significance of $\Psi$and Ψ^2 – Eigen functions and Eigen values-shapes of different orbitals – Differences between an orbit and orbital.

Electronic structure

1.2. Pauli's Exclusion principle and its application-Hund's rule-its basis and applications - stability of half-filled and fully - filled orbitals-Aufbau principle and its limitations.

1.3. Periodic properties: Atomic and ionic radii, Ionization Energy, Electron affinity and Electronegativity – Definition, Variation of the periodic properties along periods and groups-theoretical explanation for the variations.

1.4. s, p, d and f block elements-classification and characteristic properties.

UNIT-II

Principles of Qualitative analysis: Basic principles of Inorganic semimicro analysis-semimicro techniques-principles involved in Na_2CO_3 extract preparation-common ion effect and solubility product and their applications in qualitative analysis - separation of cations into groups.

Principles of Volumetric analysis- Definition of molarity, molality, normality and mole fraction-Definition and examples for Primary and Secondary standards. Theories of acid-base, redox, iodometric and iodimetric titrations-calculations of equivalent weight - Theories of acid-base, redox, adsorption and fluorescence indicators and choice of indicators

UNIT - III Structure and Bonding

3.1. Electron displacement effects :

3.1.1. Inductive, inductomeric and steric effects-their effect on properties of compounds

3.1.2.Mesomeric, resonance, hyperconjugation-localised and delocalised chemical bond

3.2.Intermolecular interactions-Dipole-Dipole interaction, van der Waals forces, hydrogen bond and its types-effect of intermolecular forces on physical properties-melting point, boiling point and solubility.

3.3.Reactive intermediates -carbocations, carbanions, free radicals and carbenes with examples.

3.4.Cycloalkanes-Wurtz reaction, Dieckmann ring closure & reduction of aromatic hydrocarbons -.Baeyer's strain theory and its limitations-Sache-Mohr theory– Ring strain in small rings (cyclopropane and cyclobutane)-theory of strainless rings.

3.6.Alkenes:

Electrophilic and free redical mechanism of addition in alkenes-Markownikoff's rule-peroxide effect-mechanism of Hydroboration, Ozonolysis and allylic substitution by NBS.

1,2 and 1,4 additions-thermodynamic and kinetic controlled products-Diels - Alder reaction.

UNIT-IV

Chemical Bond

4.1.1. Ionic bond-mode of formation – properties of ionic compounds-inert pair effect-Born-Haber cycle-polarisation of ions-factors affecting polarisation-importance of polarisation of ions-Fajan's rules and applications.

4.1.2. Covalent Bond-mode of formation-properties of covalent compounds-Valence Bond theory-Postulates of Pauling-Slater's theory-Different types of overlapping. Molecular orbital theory-Postulates-Bonding and antibonding molecular orbitals-Tabulation of various M.Os formed from atomic orbitals-Energy level diagrams for M.Os-Bond order-Electronic configuration of Hetero nuclear diatomic molecules - CO, NO and HF.

4.1.3. Coordinate Bond-mode of formation-importance of coordinate bond in the formation of metal complexes.

Hydrides,Carbides and Noble gases

4.2.1. Hydrides-Classification-Types of Hydrides-Ionic Hydrides-LiH and NaH-Preparation, properties and uses.

Covalent Hydrides – silanes - General study - Chemistry of monosilanes and disilanes-Differences between silanes and alkanes.

Metallic Hydrides-Preparation, properties, and uses (A brief study.) Complex Hydrides-$NaBH_4$ and $LiAlH_4$-preparation, properties, and uses.

4.2.2. Carbides-Preparation, properties and technical applications.

4.2.3. Noble Gases-position of Noble gases in the periodic Table –Preparation, properties and structure of compounds of Xenon.

UNIT-V

The Gaseous State

5.1.1. **Behaviour of ideal gases.**

Kinetic molecular theory of gases-the kinetic gas equation-Derivation of the gas laws-kinetic theory and temperature-Boltzmann constant-Maxwell's distribution of molecular velocities-types of molecular velocities- collision diameter-collision freqeuency-mean free path-Degrees of freedom of gaseous molecules-Principle of equipartition of energy.

5.1.2. **Behaviour of Real gases**

Deviations from ideal behaviour- -Explanation of deviations - Boyle point. The virial equation of state-derivation of the principle of corresponding states.

The Liquid State:

5.2.1. Structure of liquids-Vapour-pressure-Trouton's rule-surface tension-surface energy-some effects of surface tension-viscosity-effect of temperature on viscosity (Experimental determination of surface tension and viscosity not necessary)-Refractive index-specific refraction-molar refraction. Physical properties and chemical constitution-Molar volume and chemical constitution-Parachor and chemical constitution-Viscosity and chemical constitution-Molar refraction and chemical constitution.

B.Sc.CHEMISTRY-SECOND YEAR

PAPER – II

GENERAL CHEMISTRY – II (180 Hours)

UNIT-I

1.1. Transition Elements and Group Study

1.1.1.Transition Elements – position in the Periodic Table-General characteristics of d-block elements – an objective study of the properties expected.

1.1.2.Occurrence, extraction, properties and uses of Titanium, Zirconium, Molybdenum, Tungsten and Platinum.

1.1.3.Chemistry of Titanium dioxide, Titanium tetrachloride, Vanadium pentoxide, Ammonium Vanadate, Zirconium dioxide, Zirconium halides, Ammonium molybdate, Molybdenum blue, Tungsten tri oxide, Tungsten Bronzes, Chloroplatinic acid and Barium Platinocyanide.

1.1.4.Group study of Ti, V and Cr groups.

1.2. Nuclear Chemistry

1.2.1. Nuclear stability-n/p ratio- nuclear forces-Exchange theory and nuclear fluid theory.

1.2.2 Natural radioactivity – modes of decay-Geiger – Nuttal rule. Units of radioactivity – Kinetics of radioactive disintegration-Half life and average life-Radioactive equilibrium – Numerical problems

1.2.3. Mass defect and binding energy - Artificial transmutation and artificial radioactivity.

1.2.4. Nuclear fission and nuclear fusion-mechanisms-applications-differences – Stellar Energy.

1.2.5. Application of radioactive isotopes-C-14 dating, rock dating –Numerical problems - isotopes as tracers-study of reaction mechanism (e.g. ester hydrolysis), radiodiagnosis and radiotherapy.

1.2.6. Nuclear reactors in India..

UNIT-II

2.1. **Alkynes**- Acidity of alkynes-formation of acetylides-oxidation - ozonolysis and hydroboration, addition of water with $HgSO_4$ catalyst.

2.1.1 Reaction mechanism II

Aliphatic nucleophilic substitution- S_N1, S_N2 and S_Ni reactions – Reactivity-effects of structure of substrate, attacking nucleophile, leaving group and reaction medium

Elimination reactions-mechanisms of E_1 and E_2 reactions-cis and trans eliminations-Hofmann and Saytzeff rule.

2.1.2. Unsaturated alcohols-preparation and reactions of allyl alcohol.

2.2. Aromatic hydrocarbons and aromaticity-reasonance in benzene-delocalised cloud in benzene-aromaticity-Huckel's (4n+2) rule and its simple applications.

2.2.1. Reaction mechanism III

Electrophilic substitution reactions in aromatic compounds-general mechanism –Nitration, Halogenation, Sulphonation, Friedel-Crafts acylation and alkylation-directive influence – Orientation-ortho/para ratio.

2.2.2. Polynuclear aromatic hydrocarbons- naphthalene and anthracene -isolation, synthesis ,properties, and uses.

2.3.. **Reaction mechanism-IV**

2.3.1.Mechanism of -Kolbe's reaction-Reimer-Tiemann reaction-Gattermann, Lederer- Manasse and Houben-Hoesch reactions,perkins and haloform reactions.

2.3.2. Cresols, nitrophenols, aminophenols-alpha and beta naphthols-preparation and uses

2.3.3. Epoxides-synthesis, properties and uses, Crown ethers.

UNIT-III

3.1 **Reaction mechanism V**

3.1.1.Addition to Carbon –heteromultiple bond - Addition of HCN, NH_20H, 2,4-dinitrophenyl hydrazine, semicarbazide & Grignard reagent .

3.1.2.Mechanisms of Mannich, Stobbe, Darzen, Wittig and Reformatsky reactions.

3.2. **Carboxylic acids**

3.2.1. Unsaturated acids-preparation and properties of acrylic, crotonic and cinnamic acids

3.2.2. Hydroxy acids-classification – preparation of Glycolic acid -Action of heat on α,β,γ and δ acids.

3.2.3. Dicarboxylic acids-preparation of oxalic, malonic, succinic, glutaric and adipic acids.Action of heat on these acids.

3.3.**Reaction mechanism VII**

3.3.1.Mechanism of esterification including trans esterification.

3.3.2.Hydrolysis of esters-mechanism

3.3.3. Tautomerism-definition-keto-enol, amido-imido and nitro-acinitro tautomerisms-acid-base inter conversion mechanism.

3.3.4. Malonic, and Acetoacetic esters - characteristic reactions of active methylene group -synthetic uses.

3.3.5. Diazonium compounds-diazotisation mechanism-diazonium ion as a weak electrophile-preparation and synthetic uses of diazoacetic ester & diazomethane.

UNIT IV

4.1. **The Solid State** - Difference between crystalline and amorphous solids-isotropy and anisotropy- space lattice and unit cell-Bravis lattices- -Law of rational indices-Miller indices-X ray diffraction-Bragg's equation-Experimental methods.

4.2. **The colloidal State**

Definition of colloids-Classification of colloids - solids in liquids (sols) - properties-Kinetic, optical and electrical-stability of colloids, protective action-Hardy-Schulze law, gold number.

Liquids in liquids (emulsions): Types of emulsions-preparation, emulsifier

Liquids in solids (gels): classification, preparation and properties, inhibition-general applications of colloids.

4.3.**Polymer Chemistry**

4.3..1. Basic concepts: Monomers for addition polymers and condensation polymers, repeat units, polymer structures.Linear, branched and network polymers.

4.3.2. Copolymers - block, alternating and graft copolymers

4.3.3. Mechanism and kinetics of Free radical addition polymerization

4.3.4. Average molecular weight concept-number and weight average molecular weight

4.3.5. Polymer processing: Film casting, injection moulding and Fibre spinning.

4.3.6. Application of polymers: Applications of polythene, Polyvinyl resins and biomedical polymers for contact lenses and dental uses.

UNIT V

5.1. The first law of thermodynamics and thermochemistry

5.1.1 -Expansion of an ideal gas-work done in reversible isothermal expansion-work done in reversible isothermal compression-work done in reversible adiabatic expansion – Joule-Thomson effect, Joule-Thomson coefficient-Inversion temperature-zeroth law of thermodynamics-Absolute temperature scale.

5.1.2. Kirchoff's equation-Flame and explosion temperatures.

5.2. Second law of thermodynamics-I

5.2.1. Limitations of the first law-need for second law-spontaneous processes-cyclic process-Carnot cycle –efficiency-Carnot theorem-Thermodynamic scale of temperature.

5.2.2. Concept of entropy-Entropy-a state function-Entropy change in isothermal expansion of an ideal gas-entropy change in reversible and irreversible processes-Clausius inequality-Entropy change accompanying change of phase-calculation of entropy changes of an ideal gas with changes in P, V and T –Entropy of mixture of ideal gases-entropy of mixing-physical significance of entropy.

5.3. Second law of thermodynamics-II

5.3.1. Work and free energy functions-Maxwell's relationships criteria for reversible and irreversible processes -Gibbs-Helmholtz equation-Partial molar free energy . Concept of chemical potential-Gibb's Duhem equation-Chemical potential in a system of ideal gases-

Duhem-Margulus equation .Clapeyron equation-Clapeyron- Clausius equation-Applications of Clapeyron-Clausius equation-concept of fugacity-Determination of fugacity of a gas-Fugacity of a liquid component in a liquid solution-concept of activity-activity coefficient-standard states.

5.4. Third law of thermodynamics

Nernst heat theorem-statement of III law-Evaluation of absolute entropy from heat capacity measurements-Test for the validity of the law.

B.Sc.CHEMISTRY-THIRD YEAR

PAPER – III

INORGANIC CHEMISTRY (120 Hours)

UNIT-I

Concept of acids, bases and Non aqueous solvents

1.1. Acids and Bases: Arrhenius, Bronsted-Lowry, the Lux-Flood, Solvent system and Lewis concepts of acids and bases.Relative strength of acids and bases-Effect of solvent-Levelling effect.

1.2. Hard and Soft Acids and Bases-classification of acids and bases as hard and soft – examples-Pearson's HSAB concept - Applications of HSAB principle

1.3. Non-aqueous solvents-physical properties of a solvent, types of solvents and their general characteristics. Reactions in non-aqueous solvents with reference to liq. NH_3 and liq SO_2- Comparison.

Chemistry of f-block elements

1.4. Position in the Periodic Table-General characteristics of Lanthanides and Actinides-Lanthanide contraction and its consequences.

1.4.1 Isolation of Lanthanides from Monazite including the Ion exchange resin method.

1.4.2. Actinides-occurrence and preparation

1.4.3 Comparison of Lanthanides and Actinides.

1.4.4. Elements with atomic number 104 and 105-their position in the periodic table and synthesis.

UNIT II Coordination Chemistry

2.1. Definition of the terms-Classification of ligands-Nomenclature of mononuclear and polynuclear complexes-chelating ligands and chelates-Examples-chelate effect-explanation.

3.2. Werner's theory-conductivity and precipitation studies 2Sidgwick's theory-Effective Atomic Number concept.

2.3. Isomerism in complexes-Structural Isomerism—types. Stereoisomerism-Geometrical isomerism in 4 and 6 coordinated complexes- Optical isomerism in 4-and 6-coordinated complexes-

2.4. Factors affecting the stability of complexes.

2.5. Theories of bonding in complexes-Valence Bond Theory-Postulates –Hybridisation and geometries of complexes-Outer orbital and inner orbital octahedral complexes. Square planar and tetrahedral complexes-V.B. Theory and magnetic properties of complexes-limitations of V.B. Theory.

2.6 Crystal Field Theory-postulates-d-orbital splitting in octahedral, tetrahedral and square planar complexes-strong and weak ligands-Spectrochemical series-High spin and low spin complexes-C.F. Theory and magnetic properties of complexes-Crystal Field Stabilisation Energy (CFSE) and its uses-Calculation of CFSE values of d^1 to d^{10} Octahedral and Tetrahedral complexes- C.F theory and colour of complexes-limitations of C.F. theory-comparison between VBT and CFT.

UNIT-III Application of Complexes and Environmental Chemistry

3.1. Complexometric Titrations-Principles and Types of titrations using EDTA.

3.2. EDTA and its applications –estimation of metals,hardness of water and sequesterisation.

3.3. **Environmental Chemistry**

3.3.1. Bhopal gas tragedy, Chernobyl disaster and Minimata diseases-A brief study

3.3.2. Air pollution-sources. Green House effect-Green House gases-Impact of Green House effect-Effects on ecosystem-measures to reduce the Green House effect.

3.3.3. Depletion of Ozone layer-Effects of Oxides of Nitrogen on Ozone layer-fluorocarbons and their effect on Ozone layer-methods to control ozone depletion.

3.3.4. Smog-photochemical smog-mechanism of formation.

3.3.5. Water pollution-sources-BOD and COD and its importance. .

3.3.6. Soil pollution-sources-indiscriminate use of fertilizers and pesticides-dumping of urban solid waste, industries waste and radioactive waste-methods of disposal of wastes.

3.3.8. Noise pollution and Radioactive pollution- health

UNIT-IV

4.1. Bioinorganic Chemistry-Essential and trace elements in Biological processes- Biological role of Haemoglobin and Chlorophyll (elementary idea of structure and mechanism of their action)

4.2. Metal carbonyls-Bonding in carbonyls-Mono and binuclear Carbonyls of Ni, Fe, Cr, Co and Mn-Hybridisation and structure. Preparation, properties and uses.

4.3. Silicates-classification and structure–examples.

4.4 Organometallic compounds

4.4.1. Definition-classification-ionic, σ-bonded and non

classically bonded organometallic compounds-examples- nature of carbon-metal bond.

4.4.2. General methods of preparation – formation by addition and substitution reactions. General properties of organometallic compounds -physical and chemical characteristics.

4.4.3. Organometallic compounds of Li & B - preparation, properties, structure and uses.

4.4.4 Olefin complexes -Zeise salt –synthesis and structure

4.4.5. Cyclopentadienyl complexes- Ferrocene- Preparation,properties, structure and uses.

4.4.6. Uses of organometallic compounds.

UNIT-V

5.1. Solids: Band theory of conductors , semiconductors and insulators

5.2. Bragg's law and application of X-ray diffraction to crystal studies-structure of NaCl, LiCl and ZnS.

5.3. Imperfections in a crystal-Outline of Schottky defects, Frenkel defects, metal excess and metal deficiency defects and line defects.

5.4. Symmetry Elements and Symmetry operations – point groups-point groups of simple molecules like H_2, HCl, CO_2, H_2O, BF_3, NH_3,CH_2Cl_2, $[PtCl_4]^{2-}$, PCl_5, Cis and trans isomers of $[Pt(NH_3)_2 Cl_2]$

5.5. Magnetic properties of molecules: Magnetic susceptibility. Types of magnetic behaviour- diamagnetism and paramagnetism, Temperature and magnetic behaviour, Ferromagnetism and antiferromagnetism-Temperature independent paramagnetism-determination of magnetic moment using Guoy Balance-Applications of magnetic measurements.

B.Sc.CHEMISTRY-THIRD YEAR

PAPER – IV

ORGANIC CHEMISTRY (120 Hours)

UNIT I Stereoisomerism

1.1.Definition-Classification into Optical and Geometrical isomerism.

1.2. Optical isomerism – Optical activity-Optical and Specific rotations-conditions for optical activity-asymmetric centre-Chirality-achiral molecules-meaning of (+) and (-) and D and L notations-Elements of symmetry.

1.3 Projection formulae-Fischer, Flying Wedge, Sawhorse and Newmann projection formulae-Notation of optical isomers- Cahn-Ingold –Prelog rules-R-S. notations for optical isomers with one and two asymmetric Carbon atoms-erythro and threo representations.

1.4. Racemisation-methods of racemisation (by substitution and tautomerism)-Resolution-methods of resolution (mechanical, seeding, biochemical and conversion to diastereoisomers)-Asymmetric synthesis (partial and absolute synthesis) Walden inversion.

1.4. Optical activity of allenes , spiranes and biphenyls.

1.5. Geometrical isomerism- cis-trans, syn-anti and E-Z notations-geometrical isomerism in maleic and fumaric acids and unsymmetrical ketoximes-methods of distinguishing geometrical isomers using melting point, dipole moment, dehydration, cyclisation and heat of hydrogenation.

1.6. Conformational Analysis-introduction of terms-conformers-dihedral angle, torsional strain, conformational analysis of ethane, ethylene glycol, chlorohydrin and n-butane including energy diagrams-conformers of cyclohexane (chair, boat and skew boat forms)-axial and equatorial bonds-ring flipping showing axial equatorial interconversions-conformers of mono and disubstituted

cyclohexanes-1:2 and 1:3 interactions-Conformation and stereochemistry of Cis and Trans decalins

UNIT II-CARBOHYDRATES

2.1.Classification

2.2.Monosaccharides-Reactions of Glucose and Fructose-osazone formation.

2.3.Constitution of glucose and fructose-open chain structure-Configuration and ring structure-mutarotation-determination of ring size

2.4.Haworth's projection formulae and conformation of monosaccharides.

2.5.Interconversions of monosaccharides-epimerisation-conversion of pentose to hexose and vice versa-aldose to ketose and vice versa.

2.6.Disaccharides-structural elucidation of sucrose and maltose.

2.7.Polysaccharides-structure of starch and cellulose-

properties-derivatives of cellulose.

UNIT- III

Heterocyclic Compounds .

2.3. Preparation, properties and uses of furan, pyrrole & thiophene and aromatic character.

2.4. Synthesis and reactions of pyridine and piperidine-comparative study of basicity of pyrrole, pyridine and piperidine with amines.

2.5. Condensed five and six membered heterocyclics-preparation of indole, quinoline and isoquinoline-Fischer indole

synthesis, Skraup synthesis and Bischer-Napieralski synthesis-Electrophilic substitution reactions.

Amino acids and proteins

3.1. Amino acids-classification-essential and non essential amino acids-preparation of alpha amino acids-glycine, alanine and tryptophan-General properties of amino acids-Zwitter ions, isoelectric point

3.2. Peptides-synthesis - Bergmann method-structure determination of polypeptides-end group analysis.

3.3. Proteins-classification based on physical and chemical properties and on physiological functions-primary and secondary structure of proteins-helical and sheet structures (elementary treatment only) – Denaturation of proteins.

3.4.**Vitamins**

Vitamins-occurrence and biological importance of Vitamin A, Thiamine, Riboflavin, Pyridoxin and Ascorbic acid. – Synthesis and structural elucidation of ascorbic acid.

UNIT- IV

4.1. Dyes

4.1.1.Theory of colour and constitution

4.1.2. Classification - according to structure and method of application.

4.1.3. Preparation and uses of

(i) Azo dyes-methyl orange and bismark brown

(ii) Triphenyl methane dyes-malachite green

(iii) Phthalein dyes-phenolphthalein

(iv) Vat dyes-indigo.Anthraquinone dyes - Alizarin

4.2. Nucleic acids

4.2.1. Nucleic acids-structures of ribose and 2-deoxyribose-DNA and RNA – their components – Biological functions of nucleic acids-Elementary ideas on replication and protein synthesis.

4.3. Chemistry of Natural products

4.3.1. Alkaloids -classification- isolation– general methods of determination of structure of alkaloids-synthesis and structural elucidation of piperine, conine and nicotine.

4.3.2. Terpenes-classification-isolation- isoprene rule-synthesis and structural elucidation of citral, geraniol, alpha terpeneol and alpha pinene

UNIT -V

5. Molecular rearrangements-.Classification as anionotropic, cationotropic and intermolecular and intramolecular.

5.2.Mechanisms of pinacol-pinacolone, Beckmann, benzidine, Hofmann, Curtius, Lossen, Schmidt, benzilic acid, Fries and Cope rearrangements.

5.3.Important reagents and their applications in organic chemistry – $AlCl_3$, BF_3, $LiAlH_4$, $NaBH_4$, PCl_5 ,P_20_5,Na/ethanol, alcoholic KOH, H_2/Ni, H_2/Pd-$BaS0_4$, Zn/Hg-HCl, H_2N-NH_2/C_2H_5ONa, Ag_2O, HIO_4, Lead tetra acetate and Osmium tetroxide.

B.Sc.CHEMISTRY-THIRD YEAR

PAPER – V

PHYSICAL CHEMISTRY (120 Hours)

UNIT-I Solutions

1.1. Solutions of gases in liquids – Henry's law- solutions of liquids in liquids-Raoult's law-Binary liquid mixture-ideal solution-deviation from ideal behaviour-Thermodynamics of ideal solutions-V.P-Composition curves, V-P-temperature curves-Azeotropic distillation.

1.2. Nernst's Distribution law-Thermodynamic derivations-applications. Solvent extraction.

1.3. Thermodynamic derivation of elevation of boiling point and depression of freezing point-van't Hoff factor-Abnormal molecular mass-Degree of dissociation and association.

Chemical Equilibrium

1.4. Thermodynamic derivation of equilibrium constants-Kp, Kc and Kx-Relations between Kp, Kc and Kx-Standard free energy change-Derivation of van't Hoff reaction isotherm

De Donder's treatment of chemical equilibria-concept of chemical affinity (no derivation)-Temperature dependance of equilibrium constant-van't Hoff isochore-Pressure dependance of equilibrium constant.

1.5 Adsorption- Physical and chemical adsorption-Types of adsorption isotherms-Freundlich adsorption isotherm-Derivation of Langmuir adsorption isotherm-BET isotherm (postulates only) BET equation (statement). Determination of surface area-Applications of adsorption.

UNIT-II Chemical Kinetics

2.1. Derivation of rate constant of a second order reaction-when the reactants are taken at different initial concentrations-when the reactants are taken at the same initial concentrations-Determination of the rate constant of a II order reaction-Derivation of rate constant of a third order reaction-when the reactants are taken at the same initial concentrations.

2.2. Methods of determining the order of a reaction-Experimental methods in the study of kinetics-volumetry, manometry, polarimetry and colorimetry.

2.3 Kinetics of fast reactions by temperature jump method(no derivation) Effect of temperature on reaction rates-Derivation of Arrhenius equation-concept of activation energy-determination of Arrhenius frequency factor and energy of activation.

2.4. Collision theory of reaction rates-Derivation of rate constant of a bimolecular reaction from collision theory-Failures of CT.

2.5.Lindemann theory of unimolecular reactions.

2.6.Theory of Absolute Reaction Rates-Thermodynamic derivation of rate constant for a bimolecular reaction based on ARRT-comparison between ARRT and CT. Significance of free energy of activation and entropy of activation.

2.7.Kinetics of complex reactions of first order opposing, consecutive and parallel reactions-examples with mechanism (no derivation)

UNIT-III - Photochemistry

3.1.Grotthus-Draper law-The Stark Einstein law of photochemical equivalence-Quantum efficiency (quantum yield).

3.2.Energy transfer in photochemical reactions-photosensitisaiton-Photosynthesis in plants-Chemiluminescence - fluorescence and phosphorescence-lasers-uses of lasers.

3.3.Photochemical reactions-Kinetics of hydrogen-bromine reactions-decomposition of HI – Photolysis of aldehydes and ketones (Mechanism only)

Phase Rule

3.4.Definition of terms-Derivation of phase rule -One component systems-H_2O system, Sulphur system – explanation using Clausius - Clapeyron equation-supercooling and sublimation.

3.5.Two component systems-solid liquid equilibria-reduced phase rule – simple eutectic systems-Ag-Pb only-Compound formation with congruent melting point-Mg-Zn system only

3.6.Peritectic change-$FeCl_3$-H_2O system, KI-H_2O system-efflorescence-deliquescence.

3.7.C.S.T-phenol water system only- Effect of impurities

UNIT – IV -**Electro chemistry**

4.1.Metallic and electrolytic conductance –Definitions of specific, equivalent and molar conductances – Relations between them – measurement of conductance and cell constant.

4.2.Variation of conductance with dilution – Qualitative explanation – Strong and weak electrolytes.

4.3.Migrations of ions – transport number – determination by Hittorf and moving boundary methods – Kohlrausch's law – applications – calculation of equivalent conductance for weak electrolytes and determination of transport number.

4.4.Ionic mobilities and Ionic conductances.Diffusion and ionic mobility- molar ionic conductance and viscosity- Walden rule.

4.5.Applications of conductance measurements – Degree of dissociation of weak electrolytes – Determination of Ionic product of

water – Determination of solubility of sparingly soluble salts – conductometric titrations.

4.6.Theory of strong electrolytes – Debye – Huckel – Onsager theory – verification of Onsager equation – Wien and Debye – Falkenhagen effect.

4.7.Activity and activity co-efficients of strong electrolytes – ionic strength.

4.8.Ostwalds dilution law – determination of dissociation constants – Ionic product of water – pH value.

4.9.Buffer solution – Henderson's equations – uses of Buffers including living systems .

4.10.Hydrolysis of salts – expression for hydrolysis constant – Degree of hydrolysis and pH of salt solutions for different types of salts – Determination of Degree of hydrolysis – conductance and distribution methods.

UNIT – V

5.1.Galvanic cells – Reversible and Irreversible cells – EMF and its measurement – Weston Standard cell – types of reversible single electrodes – standard Hydrogen electrode – calomel electrode – Derivation of Nernst equation both for emf of cells and single electrode potentials – Nernst theory for single electrode potential – standard reduction potentials – electro chemical series – significance.

5.2.Application of emf measurements – Application of Gibbs – Helmholtz equation to galvanic cells – calculation of thermodyamic quantities – pH using hydrogen, quinhydrone and glass electrodes – potentiometric titrations.

5.4. Concentration cells with and without transference – LJP expression – applications of concentrations cells – valency of ions – transport number – solubility product – activity coefficient.

5.5. Storage cells – Lead storage battery – mechanism of charging and discharging fuel cells – hydrogen – oxygen cell – polarization - overvoltage- decomposition voltage.

B.Sc.CHEMISTRY-THIRD YEAR

PARER- VI

ANALYTICAL CHEMISTRY (120 Hours)

UNIT – I

1. **The Role of Analytical Chemistry**

1.1 Importance of analytical methods in Qualitative and Quantitative analysis- Chemical and instrumental methods- advantages and limitations of chemical and instrumental methods- methods of analysis- steps in analysis.

1.2 Safety Measures: Handling reagents and solutions-acids, alkali, bromine water, phenol, inflammable substances etc.,-Disposal of wastes, waste chemicals and fumes

1.3 Data analysis- idea of significant figures- its importance- accuracy- methods of expressing accuracy- error analysis- types of errors- minimizing errors- precision- methods of expressing precision-mean, median, mean deviation, standard deviation and confidence limits.

1.4 Chemical and single pan balance- precautions in using balance- sources of error in weighing-correction for buoyancy, temperature effects - calibration of weights.

1.5.Gravimetric Analysis

1.5.1.. Principle- theories of precipitation- solubility product and precipitation - factors affecting solubility. Conditions of precipitation- co-precipitation & post precipitation, reduction of errors. Precipitation from homogeneous solution- washing and drying of precipitate.

1.5.2. Choice of the precipitant- Specific and Selective precipitants-, Anthranilicacid, Cupferon, Dimethylglyoxime, Ethylenediamine, 8-Hydroxyquinoline, Salicylaldoxime, - Use of masking agent.

1.5.3. Crucibles- types, care and uses. Calculations in gravimetric analysis- use of gravimetric factor.

UNIT - II

Chromatographic Techniques

2.1.Column Chromatography- principle, types of adsorbents, preparation of the column, elution, recovery of substances and applications.

2.2. TLC- principle, choice of adsorbent and solvent, preparation of chromatoplates, R_f -values, factors affecting the R_f-values. Significance of R_f-values.

2.3.Paper Chromatography- principle, solvents used, development of chromatogram, ascending, descending and radial paper chromatography. Paper electrophoresis- separation of amino acids and other applications.

2.4.Ion-exchange chromatography- principle- types of resins- requirements of a good resin- action of resins- experimental techniques- separation of Na-K, Ca-Mg, Co-Ni, and Chloride-Bromide. Analysis of milk and apple juice.

2.5.Gas Chromatography (GC)- principle- experimental techniques- instrumentation and applications.

2.6.High Pressure Liquid Chromatography (HPLC)- principle- experimental techniques- instrumentation and advantages.

2.7.Purification Techniques

Purification of organic compounds- solvent extraction Soxhlet extraction, crystallization- fractional crystallization and sublimation- principle- technique and advantages.

Purification of liquids-distillation, fractional distillation, vacuum distillation- steam distillation-azeotropic distillation, criteria of purity- melting point, boiling point, refractive index and density.

UNIT- III

Electro Analytical Method

3.1 Polarography- principle, concentration polarization, dropping mercury electrode (DME)- advantages and disadvantages- migration, residual, limiting and diffusion currents- Use of supporting electrolytes-Ilkovic equation (derivation not required) and significance- experimental assembly- current voltage curve- oxygen wave-influence of temperature and agitation on diffusion layer. Half wave potential ($E_{1/2}$)- Polarography as an analytical tool in quantitative and qualitative analysis.

3.2. Amperometric titrations – Basic principle – titrations- advantages, disadvantages – applications.

3.3.Thermoanalytical Methods

Principle - thermogravimetric analysis and differential thermal analysis-discussion of various components with block diagram-TGA & DTA curves of $CuSO_4.5H_20$, $MgC_20_4.$ H_20 and Ca $(OOCCH_3)_{2.}H_20$- Simultaneous DTA-TGA curves of $SrCO_3$ in air and $CaC_2O_4.H_2O$ in air and in CO_{2-} factors affecting TGA & DTA curves.

Thermometric titrations-principle- apparatus- applications.

UNIT IV

Infrared and Raman spectroscopy

4.1. Infrared spectroscopy-theory-instrumentation-block diagram-source- monochromator-cell- detectors and recorders-sampling techniques - stretching and bending vibrations-vibrational frequencies-vibrational modes of H_2O and CO_2 –study of hydrogen bonding.

Interpretation of IR spectra of Acetone, Anisole, Benzaldehyde, Ethyl acetate, Ethyl amine, Ethyl bromide, Toluene and Isopropyl phenyl ketone.

4.2.Raman Spectroscopy-Rayleigh and Raman scattering-stokes and antistokes lines-instrumentation - block diagram-differences between IR & Raman spectroscopy –mutual exclusion principle-applications.

Spectrophotometric and colorimetric analysis

4.3. UV-Visible sprectroscopy-Beer-Lambert's law– instrumentation – spectrophotometer-block diagram with description of components- types of electronic transitions-chromophore and auxochromes-absorption bands -factors affecting λ_{max} and intensity-applications

4.4. Colorimetry-principle-photoelectric colorimeter-estimation of Cu,Fe and Ni.

UNIT V

^{1}HNMR Spectroscopy

5.1. NMR Spectroscopy-principle of nuclear magnetic resonance – basic instrumentation- number of signals-chemical shift- shielding and deshielding-spin-spin coupling and coupling constants-TMS as NMR standard- Interpretation of NMR spectra of simple organic compounds such as Acetone, Anisole, Benzaldehyde, Ethyl acetate, Ethylamine, Ethyl Bromide, Toluene and Isopropyl phenyl ketone.

Mass spectroscopy

5.2. Mass spectroscopy-Basic principles- instrumentation-molecular ion peak, base peak, metastable peak, isotopic peak- their uses. Nitrogen rule- ring rule- fragmentation- Interpretation of mass spectra of simple organic compounds such as Acetone, Anisole, Benzaldehyde, Ethyl acetate, Ethylamine, Ethyl Bromide,Toluene and Isopropyl phenyl ketone.

B.Sc.CHEMISTRY-THIRD YEAR
APPLICATION ORIENTED SUBJECT -PAPER VII
PHARMACEUTICAL ,INDUSTRIAL and AGRICULTURAL CHEMISTRY (120 Hours)

UNIT-I

1.1.Definition of the terms-drug, pharmacophore, pharmacodynamics, pharmacopoea, pharmacology, bacteria, virus, fungus, actinomycetes, metabolites, antimetabolites, LD50, ED50.

1.2.Therapeutic index-their use in selecting drugs-Assay of drugs-various methods.

1.3. Antibiotics-Definition-classification as broad and narrow spectrum antibiotics-penicillin, ciphalosporin, ampicillin, erythromycin-structure and mode of action only (no structural elucidation, preparation, assay)

UNIT-II

2.1. Analgesics-definition and actions-narcotic and non narcotic-morphine and its derivatives-pethidine and methodone-pharmacological action-uses

2.2. Antipyretic analgesics-salicylic acid derivatives-methyl salicylate, aspirin, p-aminophenol derivatives-paraacetamol,

2.3. Antiseptics and disinfectants – definition and distinction-phenolic compounds-Dyes - crystal violet, acridine, Chloro compound-chlorhexidine, Cationic surfactants-Benzalkonium chloride, formaldehyde and nitrofurazone.

2.4. Anaesthetics-definition-classification-local and general-volatile, nitrous oxide, ether, chloroform, cyclopropane-uses and disadvantages – nonvolatile – intravenous - thiopental sodium, methohexitone, -local anaesthetics -cocaine and benzocaine.

2.5. Antianaemic drugs-iron, vitamin B12 and folic acid-mode of action

UNIT-III

3.1. Drugs affecting CNS-definition, examples for tranquilisers, sedatives, hypnotics and psychedelic drugs

3.2. Hypoglycemic agents-sulphonyl urea, biguanides.

3.3. Cancer therapy-mode of action of thiotepa, cyclophosphoramide..

3.4. AIDS-causes, prevention and control.

3.5. Indian medicinal plants and uses-tulasi , kilanelli, mango, semparuthi,adadodai and thoothuvalai

3.6.Essential oils, Isolation of essential oils from plants. Production of natural perfumes – flower perfumes – fruit flavours – artificial flavours.

3.7.Waxes, soaps and detergents – waxes – classification – some common waxes – manufacture of candles. Soaps and detergents – General consideration in soap making – manufacture of soaps and detergents – Action of soaps and detergents.

UNIT – IV

4.1.Water : Water treatment for domestic and Industrial purpose.

4.2.Fuels : Calorific value – requirement of a fuel – types of fuels. Refining crude petroleum – octane number – antiknocking compounds – lead tetra ethyl.

4.3.Industrial gases : Coal gas, producer gas, water gas, semi water gas – manufacture and industrial application, LPG – manufacture.

4.4.Bio gas – Gobar gas – production, composition – calorific value – renewable nature.

4.5. Industrial application

A brief treatment regarding composition, manufacture and uses of synthetic fibres, rubber, paints and varnishes, glass, cement and ceramics.

UNIT – V

5.1.**Fertilizers** : Effect of Nitrogen, potassium and phosphorous on plant growth – commercial method of preparation of urea, triple superphosphate. Complex fertilizers and mixed fertilizers – their manufacture and composition. Secondary nutrients – micronutrients – their function in plants.

5.2.**Manures** : Bulky organic manures – Farm yard manure – handling and storage. Oil cakes. Blood meal – fish manures.

5.3.**Pesticides and Insectides** :

Pesticides – classification of Insecticides, fungicides, herbicides as organic and inorganic – general methods of application and toxicity. Safety measures when using pesticides.

Insecticides : Plant products – Nicotine, pyrethrin – Inorganic pesticides – borates. Organic pesticides – D.D.T. and BHC.

5.4.**Fungicides and Herbicides** :

Fungicide : Sulphur compounds, Copper compounds, Bordeaux mixture.

Herbicides : Acaricides – Rodenticides. Attractants – Repellants. Preservation of seeds.

B.Sc. DEGREE

BRANCH IV-CHEMISTRY-FIRST YEAR

PRACTICAL – I INORGANIC QUALITATIVE ANALYSIS AND INORGANIC PREPARATIONS

1. Inorganic qualitative analysis : Analysis of a mixture containing two cations and two anions of which one will be an interfering ion. Semimicro methods using the conventional scheme with hydrogen sulphide may be adopted.

   Anions to be studied : Carbonate, sulphide, sulphate, nitrate, fluoride, chloride, bromide, borate, oxalate, arsenite, arsenate, phosphate, chromate.

   Cations to be studied :Lead, Bismuth, copper, cadmium, arsenic, iron, aluminium,Cobalt,Nickel,Zinc,Barium,calcium, magnesium,
   ammonium.

2. Inorganic preparations :
   a) Sodium thiosulphate
   b) Ferrous ammonium sulphate
   c) TetrammineCopper (II) sulphate
   d) Microcosmic Salt

B.Sc. DEGREE

BRANCH IV-CHEMISTRY-SECOND YEAR

PRACTICAL – II

VOLUMETRIC ESTIMATIONS

1. Acidimetry – Alkalimetry :
    a) Estimation of sodium carbonate – standard sodium carbonate.
    b) Estimation of bicarbonate and carbonate mixture
2. Permanganometry
    a) Estimation of ferrous iron
    b) Estimation of oxalic acid
3. Dichrometry
    a) Estimation of ferric iron using internal indicator
4. Iodometry and iodimetry
    a) Estimation copper
    b) Estimation of potassium dichromate
    c) Estimation of Arsenious oxide
5. Argentimetry
    a) Estimation of chloride in neutral medium
6. Complexometric Titrations
    a) Estimation of Zn and Mg using EDTA.
    b) Estimation of Hardness of water by EDTA

B.Sc. DEGREE

BRANCH IV-CHEMISTRY-THIRD YEAR

PRACTICAL – III

ORGANIC PREPAERATIONS AND

GERAVIMETRIC ANALYSIS

Organic preparations

1.Preparations involving the following :

a) Oxidation of benzaldehyde
b) Hydrolysis of Methyl salicylate or ethyl benzoate.
c) Nitration – p-nitroacetanilide and m-dinitrobenzene
d) Bromination – p- bromoacetanilide and tribromophenol
e) Benzoylation — β-naphthylbenzoate
f) Diazotization – methyl orange.

Not for examination – 3 (f)

GRAVIMETRIC ESTIMATIONS

1. Determination of percentage of water of hydration

2.Estimation of Barium as Barium sulphate

3.Estimation of Barium as Barium chromate

4.Estimation of Lead as Lead chromate

5.Estimation of Calcium as Calcium oxalate monohydrate

6.Estimation Chloride as Silver chloride.

7.Estimation of Sulphate as Barium sulphate.

8.Estimation of Nickel as Nickel dimethyl glyoxime complex

9.Estimation of Magnesium as Magnesium oxinate

10.Estimation Copper as Cuprous thiocyanate

Not for Examination : 1,8,9 and10

B.Sc. DEGREE
BRANCH IV-CHEMISTRY-THIRD YEAR
PRACTICAL – IV
ORGANIC QUALITATIVE ANALYSIS AND PHYSICAL CHEMISTRY EXPERIMENTS

ORGANIC QUALITATIVE ANALYSIS

1.Determination of boiling point of liquids.

2. Analysis of organic compounds.

Characterisation of organic compounds by their functional groups and confirmation by preparation of derivative. The following functional groups may be studied.

Aldehydes, Ketones, carboxylic acids, aromatic primary and secondary amines, phenol, aromatic ester, amide, diamide, anilide, nitro compounds and monosaccharides

Physical Experiments

1. Distribution Law :
   a) Partition coefficient of iodine between water and carbon tetrachloride.
   b) Equilibrium constant of the reaction KI + $I_2 \rightleftharpoons KI_3$
2. Kinetics
   a) Determination of rate constant – Acid catalysed hydrolysis of an ester (methyl acetate or ethyl acetate)
   b) Determination of rate constant for the reaction between potassium iodide and potassium persulphate.
   c) Determination of rate constant – acid catalysed iodination of acetone.
3. Molecular weight determination –Rast method
4. Heterogenous Equilibrium
   a) Upper critical solution temperature of phenol-water system.
   b) Effect of impurity on CST of phenol – water system and determination of concentration of sodium chloride / succinic acid.
   c) Simple eutectic system- Naphthalene – Diphenyl.

d) Determination of transition temperature of hydrated salts – sodium thiosulfate, sodium acetate, strontium chloride and manganous chloride.

5. **Electrochemistry :**

a) Conductivity
   i) Determination of cell constant
   ii) Equivalent conductance of strong and weak electrolytes
   iii) Conductometric titration- acid base titration
   iv) Dissociation constant of a weak acid

b) Potentiometry – Potentiometric titration – acid-base titration.

Not for examination : 1(b), 2 (c),4(a) and 5(a) (iv)

TEXT BOOKS AND REFERENCE BOOKS

1. Inorganic Chemistry

1) Philips and Williams, Inorganic Chemistry, Oxford University press, Vol I and II.
2) Cotton and Wilkinson, Advanced Inorganic Chemistry Wiley Eastern Private Ltd.
3) Lee Von Nastrand J.D. Concise inorganic Chemistry.
4) Manku.G.S., Inorganic Chemistry Tata Mcgraw Hill.
5) Soni.P.L, Text Book of Inorganic Chemistry, Sultan Chand & Sons.
6) Puri and Sharma, Text book of Inorganic Chemistry-Vishal publishing co.
7) Madan.R.D., Inorganic Chemistry, S. Chand & Co.,
8) Dutta, Inorganic Chemistry, Science Book Association.
9) Dara.S.S, A text book of Environmental Chemistry and Pollution control- S.Chand & Co.,
10) Dr. C.Murthy , A Text book of Environmental Sciences, Sultan Chand & Sons
11) Anil Kumar De, Text Book of Environmental Chemistry, New Age International Ltd.,
12) Starley E. Manahan, Environmental Chemistry Brooks / Cole publishing company, Monterey, California.

II. Organic Chemistry

1. Finar 1.L. Organic Chemistry, Vol I and II – ELBS.
2. Morrison and Boyd, Organic Chemistry, Allyn and Bacon Inc.
3. Solomons, T.W.G, Organic Chemistry, John Wiley.
4. Bhal. B.S, and Arun Bhal, A Text book of Organic Chemistry.
5. Soni.P.L., Text Book of Organic Chemistry, Sultan Chand and Sons.
6. Tiwari, Malhotra and Vishoni, Organic chemistry, Vol I and II , Vikas Publishing House.
7. Raj K. Bansal, A Text Book of Organic Chemistry, Wiley Eastern.
8. Singh, Mukarji and Kapoor, Organic Chemistry, Mac Millan.
9. Jain.M.K, Principles of Organic Chemistry-Vishal publishing Co.

10. Agarwal and Manivasagam -Reactions and Reagents- Pragati Prakashan
11. Kalsi.P.S, Stereo Chemistry conformation and mechanism, Wiley Eastern Ltd.,
12. Nasipuri.D, Stereo Chemistry of Organic Compounds, Wiley Eastern Ltd.,

III. Physical Chemistry

1. Glasstone.S, Text Book of Physical Chemistry, Mac Millian.
2. Glasstone and Lewis, Elements of Physical Chemistry, Mac Millan.
3. Maron and Lando, Fundamentals of Physical Chemistry, Collier, Mac Millan.
4. Castellan. G.W, Physical Chemistry, Naropa Publishing House.
5. Walter J. Moore, Physical Chemistry, Orient Longamann.
6. Rakshit.P.C, Physical Chemistry, Science Book Agency.
7. Bajapai. D.N, Advanced Physical Chemistry, S.Chand & Co.,
8. Gurudeep R. Chatwal, Physical Chemistry.
9. Jain. S, and S.P. Jauhar, Physical Chemistry – principles and problems, Tata McGraw Hill.
10. Glasstone, Thermodynamics for Chemists, Van Nostrand and Co.,
11. Rakshit, Thermodynamics, Science Book Agency.
12. Laidler.K.J, Chemical Kinetics, Harpet and Row New York.
13. Banwell, Fundamentals of Molecular spectroscopy Tata McGraw Hill.
14. Kundu and Jain, Physical Chemistry, S. Chand.
15. Text –book of physical chemistry, Vishal publishing Co
16. Nagi and Anand, Physical Chemistry – Wiley Estern.
17. Kapoor. K.L., Physical Chemistry, Mac, Millan.
18. Kuriacose and Rajaram, Chemical Thermodynmics, S. Nagin .
19. Latham.J.L, and Burgess.A.E, Chemical Kinectics, Butler worth.

V. Analytical Chemistry

1. Bassett.J, Denney.R.C, Jaffery.G.H and Mendhan.J, Vogel's Hand Book of Quantitative Inorganic Analysis ELBS – Longman.
2. Furniss. B.S, Hannaform. A.J, Rogers.V, Smith.P.W.G, and Tatchell.A.R, Vogel's Text Books of Practical Organic Chemistry.

3. Douglas A, Skoog and Donal M. West Hort, Fundamentals of analystical Chemistry Rinechan and Winston Inc., New York.
4. Janarthanam.P.B, Physico – Chemical Techniques of Analysis Vol I & II – Asian Publishing House Bombay.
5. William Kemp, Organic Spectroscopy – ELBS.
6. Venkateswaran.V, Veerasamy.R, and Kulandaivelu.R, Basic Principles of Practical Chemistry.
7. Sharma.Y.R, Elementary Organic Spectroscopy, Principles and applications- S. Chand & Co.,
8. Gopalan.R, Subramaniam.P.S, and Rengarajan.K, Elemants of Analytical Chemistry – Sultan Chand & Sons.
9. Ramachandra Sastry.A, Analytical Chemistry – K.C.S. Desikan & Co.
10. Walter E Harris Brgron Kratochvil-An introduction to Chemical Analysis.

V. Pharmaceutical Chemistry

1. Singh.H and Kapoor.V.K, Vallabh Prakashan Organic Pharmaceutical Chemistry – New Delhi.
2. Bentley and Drivers, Pharmaceutical Chemistry.
3. Allion Chidambaram, Pharmaceutical Chemistry.
4. Chatwal, Organic Pharmaceutical Chemistry.
5. Jayashree Ghosh, S, Pharmaceutical Chemistry – Chand & Co.,
6. Chatwal, Inorganic Pharmaceutical Chemistry.
7. Wealth of India Raw materials (all volumes)- CSIR Publications

VI. Industrial Chemistry

1. Sharma.B.K, Industrial Chemistry Goel Publishing House, Meerut.
2. Singh.P.P, T.M. Joseph and R.G. Dhavale, College Industrial Chemistry, Himalaya Publishing House Bombay.
3. Chakrabarthy, B.N. Industrial Chemistry – Oxford and IBH.
4. Jain and Jain, Industrial Chemistry.
5. Reinhold, Industrial Chemistry.

VII. Agricultural Chemistry

1. Brady.N.C, The Nature and properties of soils – Eruasia Publishing House (P) Ltd.,

2. Jones.V.S, Fertilizers and soil fertility – Prentice Hall of India, New Delhi.
3. Fracer.D.E.H, Chemistry of Pesticides – D.Van Nostrand Co.,

VIII. Polymer Chemistry

1. Polymer Chemisry – M.G.Arora-Anmol Publications.New Delhi.
2. Text-Book of Polymer Science-F.N. Billmeyer-New Age International
3. Polymer Chemistry-an introduction-M.P.Stevens-Oxford.
4. TextBook of Polymer Science, F.W.Billmeyer Jr.Wiley.
5. Polymer Science, V.R.Gowarker, N.V.Viswanathan and J.Sreedhar, Wiley – Eastern.

B.Sc.ALLIED CHEMISTRY

INORGANIC, ORGANIC AND

PHYSICAL CHEMISTRY (180 HOURS)

Unit-I

Chemical Bonding

1.1. Molecular Orbital Theory-bonding, antibonding and nonbonding orbitals.

M.O. diagrams of Hydrogen, Helium, Nitrogen, Fluorine and Nitric Oxide-discussion of bond order and magnetic properties.

1.2. Hydrides-classification and characteristics - preparation, properties and uses of Borazole, $NaBH_4$ and $LiAlH_4$.

1.3. Carbonyls-mononuclear and polynuclear carbonyls-Examples.

Preparation, properties and structure of $Cr(CO)_6$, $Fe(CO)_5$ and $Ni(CO)_4$.

Co-ordination chemistry

1.4-Definition of terms-classification of ligands-Nomenclature-Chelation-Examples. Chelate effect-explanation.

1.5.Werner's theory-conductivity and precipitation studies. Sidgwick's theory-Effective Atomic Number concept.

1.6.Pauling's theory-postulates-Application to octahedral, square planar and tetrahedral complexes. Pauling's theory and magnetic properties of complexes. Merits and demerits of Pauling's theory.

1.7.Biological role of Haemoglobin and Chlorophyll (Elementary idea of structure and mechanism of action).

1.8.Application of coordination compounds in qualitative and quantitative analysis-separation of Copper and Cadmium ions, Nickel and Cobalt ions-identification of metal ions like Cu, Fe and Ni. Quantitative estimation of Ni using DMG, Aluminium using Oxine.EDTA and its application.

Unit-II

2.1. Covalent Bond-Orbital Overlap-Hybridisation – Geometry of Organic molecules-Methane, Ethylene, Acetylene and Benzene.

2.2. Electron displacement Effects: Inductive, Resonance, Hyper conjugative & steric effects. Their effect on the properties of compounds.

2.3. Stereoisomerism: Symmetry-elements of symmetry- cause of optical activity, Tartaric acid. Racemisation. Resolution. Geometrical isomerism of Maleic and Fumaric acids-Keto-enol tautomerism of Acetoacetic ester-conformers of n-butane with brief explanation

2.4. Aromatic compounds-Aromaticity-Huckel's rule

2.5 Electrophilic substitution in Benzene-Mechanism of Nitration, Halogenation-Alkylation, Acylation.

2.6. Isolation, preparation,properties and structure of Naphthalene Haworth's synthesis.

2.6. Heterocyclic compounds:- Preparation, properties and uses of Furan, Thiophene, Pyrrole and Pyridine.

UNIT-III

3.1 **Carbohydrates**: Classification, preparation and properties of Glucose and Fructose-discussion of open chain and ring structure of Glucose. Mutarotation. Preparation and properties of Sucrose. Structure (detailed discussion of structure not necessary) Properties of

Starch, Cellulose and derivatives of Cellulose. Inter conversion of Glucose to Frutose and vice versa.

3.2. **Amino Acids**-classification, preparation and properties of Glycine. and Alanine. Preparation of peptides (Bergmann method only).

3.3. **Proteins:** classification according to composition, biological function and shape. Denaturation of proteins.

3.4. **Chemotherapy:** Preparation, uses and mode of action of sulpha drugs-prontosil, sulphadiazine and sulphafurazole. Uses of penicillin, chloramphenicol and streptomycin, Definition and one example each for-analgesics, antipyretics, tranquilizers, sedatives, hypnotics, local anaesthetics and general anaesthetics

Unit-IV

Nuclear Chemistry

4.1. Fundamental particles of Nucleus – nuclide, isotopes, isobars and isotones

4.2. Natural radioactivity-radioactive series including Neptunium series-Group displacement law.

4.3. Nuclear Binding energy, mass defect-Calculations.

4.4.Nuclear Fission and Nuclear Fusion-differences – Stellar energy.

4.5. Applications of radioistopes-C-14 dating, rock dating,isotopes an tracers, study of Reaction mechanism (ester hydrolysis) radiodiognosis and radiotherapy

4.6**. Photochemistry**: Grotthus-Draper law and Stark-Einstien's law of photochemical equivalence. Quantum yield. Example

for photochemical reactions- Hydrogen-Chlorine reaction (elementary idea only) photosynthesis.

4.8. **Phase Rule:** Phase rule and the definition of terms in it. Application of phase rule to water system. Reduced phase rule and its application to a simple eutetic system (Pb-Ag) Freezing mixtures.

Unit-V

5.1. Solutions: Liquid in liquid type-Raoult's law for ideal solutions. positive and negative deviation from Raoult's law-Reasons and examples, Fractional distillation and Azeotropic distillation.

5.2. Colligative properties: Review of colligative properties of dilute solutions-lowering of V.P, elevation of B.Pt and depression of F.Pt and osmotic pressure. Reverse osmosis. Abnormal molecular weights-van't Hoff factor-degree of dissociation and association-problems.

5.3. Chromatography: principle and application of column, paper and thin layer chromatography.

5.4. Electro Chemistry: Kohlrausch law -measurement of conductance, pH determination. Conductometic titrations. Hydrolysis of salts.

Derivation of K_h. pH and buffer action in living system. Galvanic cells-EMF-standard electrode potentials, reference electrodes, electrochemical series and its applications. Principle of electroplating, pH determination

ALLIED CHEMISTRY
PRACTICAL

I. TITRIMETRY

1. Estimation of Sodium hydroxide - Standard sodium carbonate.
2. Estimation of Hydrochloric acid-Standard Oxalic acid.
3. Estimation of Borax – Standard Sodium carbonate.
4. Estimation of Ferrous sulphate – Standard Mohr's Salt.
5. Estimation of Oxalic Acid – Standard Ferrous Sulphate.
6. Estimation of Sodium hydroxide – Standard. Potassium permanganate
7. Estimation of Ferrous iron using diphenylamine as internal indicator.

II. Organic Analysis :

1. Detection of elements- nitrogen, sulphur and halogens.
2. Detection of aliphatic or aromatic.
3. Detection of whether saturated or unsatured compounds.
4. Preliminary tests and detection of functional groups :aldehydes, phenols, aromatic amines, aromatic acids, dicarboxylic acids, Urea , benzamide & carbohydrate.

Model Question Paper
(For the candidate admitted from 2007-2008 onwards)
B.Sc., Degree-Branch-IV Chemistry
First Year
Paper I-General Chemistry-I

Time: Three Hours Maximum:100 marks

Section-A (10x2=20 marks)
Answer All Questions
All questions carry equal marks

1. State Heisenberg's uncertainty principle

2. Define the terms eigen value and eigen function.

3. Write the procedure for the preparation of Sodium Carbonate extract.

4. . Write down the principle behind the precipitation of Group III cations in qualitative analysis?

5. . What is Hyperconjugation?Explain with an example

6.Explain Diel's-Alder reaction with an example

7.What is meant by Inert pair effect?

8.How is Sodium Hydride prepared?Indicate its use.

9.Define the terms collision diameter and collision frequency

10.State Trouton's rule.

Section-B (5x4=20 Marks)

Answer All questions

11.Explain Photo electric effect

or

12.Explain the stability of half filled and fully filled orbitals

13. Bring out the applications of solubility product in qualitative analysis

(or)

14.Discuss the theory of redox titrations

15.What is resonance?What are the conditions for resonance?

or

16. Explain Dieckmann cyclisation reaction with an example

17.Sketch and explain the MO diagram of HF molecule

(or)

18. What are carbides? What are they used for?

19.. Deduce the equation for corresponding states

(or)

20. Explain the term Molar refraction and indicate its applications

Section-C (5x12=60 marks)

Answer All Questions

21. a. Write the schrodinger wave equation and explain the terms involved

b. Derive de Broglie equation and explain the limitations of this equation.

c. The uncertainty in the position of a moving bullet of mass 10 gm is 10^{-5} m. calculate the uncertainty in its velocity.

(or)

22. a. What are the factors which affect the magnitude of ionisation potential of an element? Discuss the variation of ionisation potential in a group and a period.

b. Which are the most stable orbitals? why?

23.a. Discuss the principle of acid-base titrations

b. Define the following terms

i) Normality ii) molarity iii) molality

c. Explain the use of indicators in acid-base titrations with special reference to pH.

(or)

24.a. What are redox titrations? Explain

b. Write a note on semi micro techniques

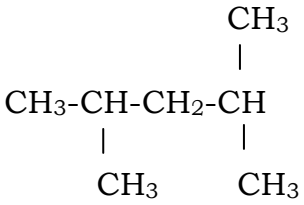
c. Differentiate iodometric and iodimetric titrations.

25. What are carbenes and Nitrenes?

Give examples

b. Give the IUPAC names of the following compounds

i)



ii) m-Xylene

c. Write a short note on primary and secondary kinetic isotope effects.

(or)

26.a. What are carbonium ions? Give two examples. Account for its stability

b. Explain the basic differences between inductive and electromeric effect with suitable examples.

c. Explain steric effect with an example.

27.What are noble gases? Why are they called so? Discuss their position in the periodic table.

Or

28.a.What are transition elements? Explain any five characteristic properties.

b.Explain the following:

I.First ionization potential of Nitrogen is higher than that of Oxygen.

ii.Electron affinity of fluorine is less than that of chlorine.

29. a. Derive kinetic gas equation for an ideal gas

b. Calculate the RMS and average velocity of Cl_2 molecule at 17^0C and 800 mm pressure.

(or)

30. a. Write notes on Parachor and chemical structure.

b. Define the viscosity of liquids.Explain the effects of temperature on viscosity.

Model Question Paper

(for the candidates admitted from 2007-2008 onwards)

B.Sc., Degree-Allied chemistry

Inorganic, Organic & Physical Chemistry

Time: 3 hrs Maximum:100 marks

Section-A (10x2=20 Marks)

Answer All questions

All questions carry equal marks

1. Differentiate bonding and antibonding molecular corbitals.

2. Calculate the EAN of Fe^{2+} in $[Fe(CN)_6)^{4-}$

3. Define hybridisation of orbitals

4. How thiophene is prepared?

5.Describe the classification of Carbohydrates..

6. Name any two sulpha drugs and give their uses.

7. What are isotones. Give example

8. Give the starting materials of polyamide and PVC

9. State Raoult's laws?

10. Mention any two electrodes used to determine pH of a solution.

Section-B (5x4=20 Marks)

Answer All Questions

11. What is meant by bond order. Find out the bond order of He, O_2^-

or

12.Give the postulates of Werner theory.

13. Write the conformers of n-butane

Or

14. Discuss the mechanism of nitration of benzene

15.Define antibiotic.Give the structure of any two antibiotics.

Or

16.Discuss the special properties of polymers

17. Calculate the nuclear binding energy of $_5B^{10}$ from the following data.

The mass of $_5B^{10}$ is 10.12939 a.m.u., the mass of a proton is 1.0072766 a.m.u and that of neutron is 1.0086654 a.m.u.

or

18. Define the following terms:

i.Fluorescence

ii.Phosphorescence

19.Write a short note on abnormal molecular weights

or

20. Draw the curve obtained in the conductometric titration of strong acid versus strong bases and explain it.

Part-C (5x12=60 Marks)

Answer all the questions

21. a. Draw the molecular orbital diagram of Nitric oxide

b.How $Ni(C0)_4$ is prepared? Indicate its properties and uses

c. Write a note on Borazole

or

22. a.State Sidgwick's theory.Explain it,using suitable examples.

b. Write an essay on the properties and uses of EDTA

23. a) Write notes on hyperconjugation

b. Explain Geometrical isomerism exhibited by maleic & fumaric acid

or

24.a. How pyrrole reacts with the following

i) $CHCl_3$ & Na0H ii) CH_2I_2 & CH_3ONa iii) $C_6H_5N_2Cl$ iv) Zn/CH_3COOH

b. Write the mechanism of Friedel Crafts alkylation

25.a.Discuss the structure of Glucose.

b.Discuss the biological function and shape of proteins

or

26.a.Define the following:

i.analgestics

ii.antipyretics

iii.tranquilizers

iv.hypnotics

b.What is meant by rubber? Relate the property of rubber with its structure

27. Write note on: i) nuclear fission ii) stellar energy

or

28. Discuss a photochemical reaction

b.Explain the following with suitable examples:

i.Photosensitized reaction

ii.Chemiluminescence.

29.a. Explain the principle of thinlayer chromatography Discuss its application

b. What are the properties of ideal solutions?

or

30.a. State and explain Kohlrausch law.

b.What is meant by hydrolysis? Derive K_h for a salt of weak acid and strong base.

B.Sc.Chemistry

SUBJECT	PAPER	suggested PAPER CODE
Major	Paper-1	07PUCH 01
Major	Paper-2	07PUCH 02
Major	Paper-3	07PUCH 03
Major	Paper-4	07PUCH 04
Major	Paper-5	07PUCH 05
Major	Paper-6	07PUCH 06
Major	Paper-7	07PUCH 07
Major	Practical-I	07PUCHP 01
Major	Practical-II	07PUCHP 02
Major	Practical-III	07PUCHP 03
Major	Practical-IV	07PUCHP 04
Allied -I	Paper	07PUCHA01
Allied -II	Paper	07PUCHA02
Allied -I	Practical	07PUCHAP01
Allied -II	Practical	07PUCHAP02

B.SC ALLIED BOT ANY

SYLLABUS

UNIT -I

Leaf Phyl1otaxy- Types of leaves- -Inflorescence -Racemose and Cymose. Tenninology with reference to flower description. Bentham and Hooker's system of classification. Study of the following families and their economic importance - Leguminosae, Rubiaceae, Lamiaceae and Arecaceae.

UNIT-II

Ultra structure of a plant *cell* and *brie£* outline of the *following* organelles endoplasmic reticulum, mitochondria, chloroplast and nucleus. Genetics - Mendal's mono and dihybrid cross.

UNIT -III

Simple" pennanent tissues - Parenchyma, Collenchyma, Sc1erenchyma. Complex pennanent tissues - Xylem and Phloem.Intemal structure of Primary Dicot stem and primary dicot root.Dicot leaf(Mesophytic leaf) Structure and development of anther, ovule, fertilization. structure and development of *dicot* empryo (capsella type).

UNIT - I V

Structure and *life* history of the *following* genera - Oedogoni um,Albugo,Fun aria, Lycopodium and Cycas.

UNIT -V

Plant Physiology: Osmosis, absorption of water. Photosynthesis - Light reaction, Calvin cycle. Respiration - Glycolysis, Krebs cycle. Ecology:Morphological and anatomical adaptations in Hydrophytes and Xerophytes.