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 necessitates 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 Branch IV - 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:

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<tr>
<th>First Year</th>
<th>Hours</th>
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<tr>
<td>Tamil Paper-I</td>
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<td>English Paper-I</td>
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<td>Major Practical-I</td>
<td>Inorganic Analysis &amp; Preparation</td>
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<td>Allied-I</td>
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<th><strong>Second Year</strong></th>
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<td>Paper-II</td>
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<td>English</td>
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<td>Major Paper-II</td>
<td>General Chemistry-II</td>
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<td>*Allied-II</td>
<td>Paper-I</td>
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<tr>
<td>Major Practical-II</td>
<td>Volumetric Estimation</td>
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<td>Allied-II</td>
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<td>Paper III</td>
<td>Inorganic Chemistry</td>
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<td>Paper IV</td>
<td>Organic Chemistry</td>
<td>3</td>
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<td>Paper V</td>
<td>Physical Chemistry</td>
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<td>Paper VI</td>
<td>Analytical Chemistry</td>
<td>3</td>
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<tr>
<td>Paper VII</td>
<td>Application Oriented subject- Pharmaceutical, industrial and Agricultural Chemistry</td>
<td>3</td>
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<tr>
<td>Practical III</td>
<td>Organic analysis and Gravimetric Estimation</td>
<td>6</td>
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<tr>
<td>Practical IV</td>
<td>Organic preparation and Physical Chemistry Experiment</td>
<td>6</td>
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(P 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 : 10×2 = 20
(Answer all questions)
(Two questions from each unit)

Part B : 5×4 = 20
(Answer all questions)
(One question from each unit with internal choice)

Part C : 5×12 = 60
(Answer all questions)
(One question from each unit with internal choice)
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 $\Psi^2$ – 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 $\text{Na}_2\text{CO}_3$ 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.


3.6. 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-NaBH₄ and LiAlH₄-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.


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.
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.


1.2.3. 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 HgSO₄ catalyst.

2.1.1 Reaction mechanism II

Aliphatic nucleophilic substitution- S₁, S₂ and Sᵢ reactions – Reactivity-effects of structure of substrate, attacking nucleophile, leaving group and reaction medium

Elimination reactions-mechanisms of E₁ and E₂ 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$_2$OH, 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 $\alpha,\beta,\gamma$ and $\delta$ 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


4.2. 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


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

5.2. Second law of thermodynamics-I


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-

5.4. Third law of thermodynamics

UNIT-I

Concept of acids, bases and Non aqueous solvents


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. NH₃ and liq SO₂ - 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.


2.6 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 Minamata diseases-A brief study


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.


3.3.8. 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.


**4.4 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 H₂, HCl, CO₂, H₂O, BF₃, NH₃,CH₂Cl₂, [PtCl₄]²⁻, PCl₅, Cis and trans isomers of [ Pt(NH₃)2Cl₂ ]

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.


5.3. Important reagents and their applications in organic chemistry - AlCl₃, BF₃, LiAlH₄, NaBH₄, PCl₅, P₂O₅, Na/ethanol, alcoholic KOH, H₂/Ni, H₂/Pd-BaSO₄, Zn/Hg-HCl, H₂N-NH₂/C₂H₅ONa, Ag₂O, HIO₄, Lead tetra acetate and Osmium tetroxide.
B.Sc.CHEMISTRY-THIRD YEAR
PAPER – V

PHYSICAL CHEMISTRY (120 Hours)

UNIT-I  Solutions


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


3.3. 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—H₂O 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—FeCl₃–H₂O system, KI–H₂O 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.


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


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


UNIT – V


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


1.5.2. Choice of the precipitant- Specific and Selective precipitants-, Anthranilicacid, Cupferon, Dimethylglyoxime, Ethylenediamine, 8-Hydroxyquinoline, Salicylaldoxime, - Use of masking agent.
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\textsubscript{1/2})- Polarography as an analytical tool in quantitative and qualitative analysis.


3.3. Thermoanalytical Methods

Principle - thermogravimetric analysis and differential thermal analysis-discussion of various components with block diagram-TGA & DTA curves of CuSO\textsubscript{4}.5H\textsubscript{2}O, MgC\textsubscript{2}O\textsubscript{4}. H\textsubscript{2}O and Ca (OOCCH\textsubscript{3})\textsubscript{2}.H\textsubscript{2}O- Simultaneous DTA-TGA curves of SrCO\textsubscript{3} in air and CaC\textsubscript{2}O\textsubscript{4}.H\textsubscript{2}O in air and in CO\textsubscript{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\textsubscript{2}O and CO\textsubscript{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 spectroscopy-Beer-Lambert’s law– instrumentation – spectrophotometer-block diagram with description of components- types of electronic transitions-chromophore and auxochromes-absorption bands -factors affecting $\lambda_{\text{max}}$ and intensity-applications


**UNIT V**

1$^H$NMR 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.
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 methadone-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.

2.5. 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


UNIT – IV


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


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


5.3. **Pesticides and Insecticides**:

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


5.4. **Fungicides and Herbicides**:

Fungicide: Sulphur compounds, Copper compounds, Bordeaux mixture.


Preservation of seeds.
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
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 PREPARATIONS 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
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 and 10
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 $\text{KI} + \text{I}_2 \rightleftharpoons \text{KI}_3$

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

I. Inorganic Chemistry

1) Philips and Williams, Inorganic Chemistry, Oxford University press, Vol I and II.
3) Lee Von Nastrand J.D. Concise inorganic Chemistry.
4) Manku.G.S., Inorganic Chemistry Tata Mcgraw Hill.
6) Puri and Sharma, Text book of Inorganic Chemistry-Vishal publishing co.
7) Madan.R.D., Inorganic Chemistry, S. Chand & Co.,
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

10. Agarwal and Manivasagam - Reactions and Reagents - Pragati Prakashan

**III. Physical Chemistry**

2. Glasstone and Lewis, Elements of Physical Chemistry, Mac Millian.
10. Glasstone, Thermodynamics for Chemists, Van Nostrand and Co.,
15. Text – book of physical chemistry, Vishal publishing Co

**V. Analytical Chemistry**

5. William Kemp, Organic Spectroscopy – ELBS.

V. Pharmaceutical Chemistry

2. Bentley and Drivers, Pharmaceutical Chemistry.
3. Allion Chidambaram, Pharmaceutical Chemistry.
7. Wealth of India Raw materials (all volumes)- CSIR Publications

VI. Industrial Chemistry

3. Chakrabarthy, B.N. Industrial Chemistry – Oxford and IBH.
4. Jain and Jain, Industrial Chemistry.
5. Reinhold, Industrial Chemistry.

VII. Agricultural Chemistry


**VIII. Polymer Chemistry**


2. Text-Book of Polymer Science-F.N. Billmeyer-New Age International


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, NaBH₄ and LiAlH₄.

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


1.5. 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).

**Unit-II**


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


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 Fructose 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.


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


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


ALLIED CHEMISTRY
PRACTICAL

I. TITRIMETRY

1. Estimation of Sodium hydroxide - Standard sodium carbonate.
2. Estimation of Hydrochloric acid - Standard Oxalic acid.
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.
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.

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

```
CH₃
```

```
i) CH₃-CH-CH₂-CH
    |   |   |
    CH₃       CH₃
```

ii) m-Xylene

c. Write a short note on primary and secondary kinetic isotope effects.
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\textsubscript{2} molecule at 17\textdegree C 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 orbitals.

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
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 $^5\text{B}^{10}$ from the following data.

The mass of $^5\text{B}^{10}$ 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(CO)$_4$ 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) CHCl₃ & NaOH ii) CH₂I₂ & CH₃ONa iii) C₆H₅N₂Cl iv) Zn/CH₃COOH

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.
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SYLLABUS

UNIT - I


UNIT-II

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

UNIT - III


UNIT - I V

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

UNIT -V
