VIJAYANAGARA SRI KRISHNADEVARAYA UNIVERSITY
JNANASAGARA CAMPUS, BALLARI-583105

Department of Studies in Chemistry

SYLLABUS

Bachelor of Science
(III, IV, V & VI Semester)

With effect from 2024-25 and onwards

VSKUB SEP Curricular and Credits Structure under CBCS Scheme for the Three Years B.Sc. Under Graduation Programme (Three Major Combination)

I – VI SEMESTER [Chemistry]

Semester	Course Code	Title of the Course	Marks			Teaching hours/week			Credit	Duration of exams (Hrs)
			IA	SEE	Total	L	T	P		
I	24MJCH1L	Chemistry - I	20	80	100	4	0	0	4	03
	24MJCH1P	Chemistry Lab Course - I	10	40	50	0	0	4	2	03
II	24MJCH2L	Chemistry - II	20	80	100	4	0	0	4	03
	24MJCH2P	Chemistry Lab Course - II	10	40	50	0	0	4	2	03
III	24MJCH3L	Chemistry – III	20	80	100	4	0	0	4	03
	24MJCH3P	Chemistry Lab Course - III	10	40	50	0	0	4	2	03
	24MJCH3S	Chemistry in daily Life	10	40	50	2	0	0	2	1.5*
IV	24MJCH4L	Chemistry - IV	20	80	100	4	0	0	4	03
	24MJCH4P	Chemistry Lab Course -IV	10	40	50	0	0	4	2	03
	24MJCH4S	Food Chemistry	10	40	50	2	0	0	2	1.5*
V	24MJCH5L	Chemistry - V	20	80	100	4	0	0	4	03
	24MJCH5P	Chemistry Lab Course - V	10	40	50	0	0	4	2	03
	24MJCH5E	Nanoscience & Renewable Energy	10	40	50	2	0	0	2	02
VI	24MJCH6L	Chemistry - VI	20	80	100	4	0	0	4	03
	24MJCH6P	Chemistry Lab Course -VI	10	40	50	0	0	4	2	03
	24MJCH6E	Medicinal Chemistry	10	40	50	2	0	0	2	02
	24MJCH6R	Project	10	40	50**	0	0	4	2	01**

VSKUB SEP Proposed Curricular and Credits Structure under Choice Based Credit System [CBCS] of Scheme for the Three Years B.Sc. Undergraduate Programme with effect from 2024-25 (Three Major Combination)

Structure with Course CHEMISTRY as one of the Majors
3rd Semester

Course code	Title of the Course	Marks			Teaching hours/week			Credit	Duration of exams (Hrs)
		IA	SEE	Total	L	T	P		
24MJCH3L	**Chemistry-III**	20	80	100	4	0	0	4	03
24MJCH3P	**Chemistry Laboratory Course-III**	10	40	50	0	0	4	2	03
24MJBB3L	2nd Major Theory-B3	20	80	100	4	0	0	4	03
24MJBB3P	2nd Major Lab-B3	10	40	50	0	0	4	2	03
24MJCC3L	3rd Major Theory-C3	20	80	100	4	0	0	4	03
24MJCC3P	3rd Major Lab-C3	10	40	50	0	0	4	2	03
24LGCC3L	Language 1	20	80	100	3	0	0	3	03
24LGCC3L	Language 2	20	80	100	3	0	0	3	03
24MJCH3S	**Chemistry in daily life**	10	40	50	2	0	0	2	1.5*
TOTAL		**140**	**560**	**700**	**20**	**0**	**12**	**26**	**-**

Structure with Course CHEMISTRY as one of the Majors
4th Semester

Course code	Title of the Course	Marks			Teaching hours/week			Credit	Duration of exams (Hrs)
		IA	SEE	Total	L	T	P		
24MJCH4L	**Chemistry-IV**	20	80	100	4	0	0	4	03
24MJCH4P	**Chemistry Laboratory Course-IV**	10	40	50	0	0	4	2	03
24MJBB4L	2nd Major Theory-B4	20	80	100	4	0	0	4	03
24MJBB4P	2nd Major Lab-B4	10	40	50	0	0	4	2	03
24MJCC4L	3rd Major Theory-C4	20	80	100	4	0	0	4	03
24MJCC4P	3rd Major Lab-C4	10	40	50	0	0	4	2	03
24LGCC4L	Language 1	20	80	100	3	0	0	3	03
24LGCC4L	Language 2	20	80	100	3	0	0	3	03
24MJCH4S	**Food Chemistry**	10	40	50	2	0	0	2	1.5*
TOTAL		**140**	**560**	**700**	**20**	**0**	**12**	**26**	-

Structure with Course CHEMISTRY as one of the Majors

5th Semester

Course code	Title of the Course	Marks			Teaching hours/week			Credit	Duration of exams (Hrs)
		IA	SEE	Total	L	T	P		
24MJCH5L	**Chemistry-V**	20	80	100	4	0	0	4	03
24MJCH5P	**Chemistry Laboratory Course-V**	10	40	50	0	0	4	2	03
24MJBB5L	2nd Major Theory-B5	20	80	100	4	0	0	4	03
24MJBB5P	2nd Major Lab-B5	10	40	50	0	0	4	2	03
24MJCC5L	3rd Major Theory-C5	20	80	100	4	0	0	4	03
24MJCC5P	3rd Major Lab-C5	10	40	50	0	0	4	2	03
24MJCH5E	**Nanoscience and renewable energy**	10	40	50	2	0	0	2	02
24RMBS5S	Elementary Research Methodology#	10	40	50	2	0	0	2	01*
TOTAL		**110**	**440**	**550**	**16**	**0**	**12**	**22**	-

Structure with Course CHEMISTRY as one of the Majors
6th Semester

Course code	Title of the Course	Marks			Teaching hours/week			Credit	Duration of exams (Hrs)
		IA	SEE	Total	L	T	P		
24MJCH6L	**Chemistry-VI**	20	80	100	4	0	0	4	03
24MJCH6P	**Chemistry Laboratory Course-VI**	10	40	50	0	0	4	2	03
24MJBB6L	2nd Major Theory-B6	20	80	100	4	0	0	4	03
24MJBB6P	2nd Major Lab-B6	10	40	50	0	0	4	2	03
24MJCC6L	3rd Major Theory-C6	20	80	100	4	0	0	4	03
24MJCC6P	3rd Major Lab-C6	10	40	50	0	0	4	2	03
24MJCH6E	**Medicinal Chemistry**	10	40	50	2	0	0	2	02
24MJCH6R	Project	10	40	50	0	0	4	2	01
TOTAL		**110**	**440**	**550**	**14**	**0**	**16**	**22**	**-**

Department Name: CHEMISTRY

Semester - III

Course Title: Chemistry-III	**Course Code: 24MJCH3L**
Total Contact Hours: 56	**No. of Credits: 04**
L:T:P	**(4,0,0)**
Internal Assessment Marks: Theory:20	**Duration of SEE:** 3 Hours
Semester End Exam Marks: 80	**Contact Hrs per week:04 Hours**

Course Outcomes (CO's):

1) Periodic properties of d and f block elements with bonding nature will be taught
2) Elementary aspects of organic compounds like alkyl halides , aryl halides, alcohol and carboxylic acid will be taught
3) Importance of quantum mechanism, thermodynamics and adsorption aspects will be taught
4) Principles and basics of separation techniques like chromatography and solvent extraction will be taught

At the end of the course, students shall be able to:

1) Understanding the properties of d and f block elements.
2) Understanding the preliminary aspects of organic compounds.
3) Explain importance of quantum mechanism, thermodynamics
4) Utilization of analytical methods in analysis

UNIT-I: INORGANIC CHEMISTRY-III **14 Hours**

d- Block Elements **07 hours**

Introduction, Position in the Periodic table.

Elements of First Transition Series: Electronic Configuration, Ionic radii, Ionisation Energy, density, and melting points. Variable Valency, Color properties, Magnetic and catalytic properties.

Elements of Second & Third Transition Series: study of Electronic Configuration, Ionic radii, Oxidation states, Color properties, Magnetic and catalytic properties.(Comparative treatment with respect to 4d & 5d analogous to 3d series)

f- Block Elements **04 hours**

Introduction, Occurance.

Lanthanides: Electronic configuration, Ionic radii, Lanthanide Contraction, Oxidation states, Magnetic & Spectral properties, Separation of lanthanides by Ion exchange Method.

Actinides: Electronic configuration, Ionic radii, Lanthanide Contraction, Oxidation states, Magnetic & Spectral properties, Formation of Complexes.

Acid Base Concepts **03 hours**

Review of important acid base theories, Leveling effect of solvents, Hard& Soft Acid Base concept-Pearson principle, Examples Electronegativity and hardness /softness, Theories of hardness & softness

UNIT-II: ORGANIC CHEMISTRY-1II 14 Hours

Alkyl & Aryl Halides **06 hours**

Alkyl Halides: Classification, Nucleophilic Substitution Reaction Mechanism- SN2 & SN1, stereo chemical aspects

Elimination Reaction mechanisms of alkyl halides- E2 & E1

Aryl Halides: Nucleophilic displacement reactions with NaOH& KCN, Wurtz- Fittigreaction &Ullmann reaction.

Alcohols & Phenols **05 Hours**

Alcohols: Classification with examples, Isomerism in Monohydric alcohols up to C_5, Lucas test to distinguish alcohols, Mechanism of Pinacol- Pincolone rearrangement.

Phenols: Classification, Acidity of Phenols & substituent effects, Mechanism of Remier-Tiemann reaction, Gattermann reaction & Fries Rearrangement

Caboxylic acids **03 Hours**

Aliphatic & Aromatic carboxylic acis, Preparation from Grignard reagents & cyanides, Acidity of Carboxylic acids – effect of substituents on acidity, Formation of salts, halides, esters & amides from carboxylic acids, Hell- Volhard- Zelinsky (HVZ) reaction

UNIT-III: PHYSICAL CHEMISTRY-1II 14 Hours

Quantum Mechanics **06 hours**

Black body radiation, Plancks radiation law, Photoelectric effect, Compton effect, Matter waves-de Broglie hypothesis, Heisenberg uncertainty principle.

Qualitative treatment of Schrodinger wave equation, Significance of wave function, Eigen Functions & Eigen values, Operators: Definition, Hermition &Hamiltonian operaters Normal and Orthogonal wave functions, Postulates of Quantum mechanics

Thermodynamics **06 Hours**

Review of consequences of First law of thermodynamics, Spontaneous process, Statement of Second law of thermodynamics, Carnots Cycle, Efficiency of engines Entropy- its physical significance, Free energy- Gibbs & Helmholtz free energy, Derivation of Gibbs- Helmholtz Equation

Third law of thermodynamics: Nernst Heat theorem, statement of third law, Residual entropies

Adsorption **02 Hours**

Review of Langmuir adsorption isotherm (No derivation), Concept of multi layer adsorption-BET equation (No derivation), determination of surface area of adsorbent

UNIT-IV: SEPARATION TECHNIQUES **14 Hours**

Chromatography:

Definition, Terms and parameters used in chromatography, classification of chromatographic methods. Factors affecting band broadening, Van-deemtter equation, rate theory, plate theory. Fundamentals of Column Chromatography- Principles, selection of stationary & mobile phase, General account of column chromatographic separation. Column Efficiency.

Paper Chromatography: Principles, Types, Theory R_f values Methods and applications.

Thin layer Chromatography (TLC):Principles, Mechanism , Methodology Criteria for selection of stationary & mobile phases, Identification and detection, spray reagents, Applications.

Solvent Extraction:

Types of Solvent extraction, Selectivity & efficiency of solvents, Nernst Distribution law, Partition coefficient - Significance in solvent extraction. Advantages of batch extraction, Solvent extraction of iron and copper.

Course Title: Chemistry Laboratory Course-III	**Course Code: 24MJCH3P**
Total Contact Hours: 54	**No. of Credits: 02**
L:T:P	**(0,0,4)**
Internal Assessment Marks: Theory:10	**Duration of SEE:** 3Hours
Semester End Exam Marks: 40	**Contact Hrs Week: 04 Hours**

Course Outcomes (CO's):

1. To prepare and estimate some inorganic compounds.
2. To prepare some organic compounds.
3. To impart skills related to preparation of stock and working solutions and handling of instrumental methods
4. To know the some inorganic reactions
5. To know the some of the reaction mechanisms

At the end of the course, students will be able to:

1. Understand the importance of semi micro analysis of inorganics for qulitative applications.
2. Learn the importance of preparation methods and also determination of inorganic compounds.

LABORATORY COURSE- III **84 Hours**

Semi micro Inorganic Qualitative Analysis of Binary Mixtures

Minimum 12 experiments are to be given for estimation.

The following radicals may be given.

Acid radicals: CO_3^-, Cl^-, Br^-, I^-, NO_3^-, SO_4^{2-}, BO_3^{2-}, acetate and oxalate

Basic radicals: NH_4^-, Cu^{2+}, Bi^{2+}, Al^{3+}, Fe^{3+}, Cr^{3+}, Mn^{2+}, Zn^{2+}, Ni^{2+}, Ba^{2+}, Sr^{2+}, Ca^{2+}, Mg^{2+}, K^+, Na^+, Li^+

Note: i) Only one basic radical in a group should be given in a mixture.

ii) Mixture of Cl^- and I^-, Cl^- and Br^-, NO_3^- and Br^-, NO_3^- and I^- should be avoided.

iii) SO_4^{2-} with Ba^{2+}, Sr^{2+}, Ca^{2+}

Course Title: Chemistry in daily life	**Course Code: 24MJCH3S**
Total Contact Hours: 28	**No. of Credits: 02**
L:T:P	**(2,0,0)**
Internal Assessment Marks: Theory:10	**Duration of SEE:** 2 Hours
Semester End Exam Marks: 40	**Contact Hrs per week:02 Hours**

Course Outcomes (CO's):

1. To study the contents of available food materials
2. To Analysis of dairy products and beverages compounds.
3. To impart skills related to preparation of stock and working solutions and handling of instrumental methods
4. To know the some adulterants and its contaminants in food
5. To know the some of the vitamins and determinants

At the end of the course, students will be able to:

1. Understand the importance of semi micro analysis of food materials for applications.
2. Learn the importance of analysis methods and also determination of food materials.

Unit-I **08 Hours**

Dairy products

Composition of milk and milk products, Analysis of fat content, minerals in milk and butter. Estimation of added water in milk. Beverages: Analysis of caffeine in coffee and tea, detection of chicory in coffee, chloral hydrate in toddy, determination of methyl alcohol in alcoholic beverages

UNIT-2 **10 Hours**

Adulteration and contamination of food

Food additive, adulterants and contaminants: Food preservatives like benzoates, propionates, sorbates, disulphites. Artificial sweeteners: Aspartame, Saccharin, dulcin, sucralose and sodium cyclamate. Flavors: Vanilline, alkyl esters (fruit flavors) and monosodium glutamate

Artificial food colourants Coal, tar, dyes and non-permitted colors and metallic salts. Analysis of pesticides, residues in food

UNIT-III **10 Hours**

Some important molecules

Vitamins: Classification and nomencluature, sources, deficiencydeseases and structure of vitamin A1, Vitamin B1, Vtamin C, Vitamin D, Vitamin E and Vitamin K1.

Oils and Fats: Composition of edible oils, detection of purity, rancidity of fats and oils. Tests for adulterants like argemone oil and mineral oils. Halphen test.

Soaps and Detergents: Definition, classification, manufactureing of soaps and detergents, composition and uses

Semester - IV

Course Title: Chemistry-IV	**Course Code: 24MJCH4L**
Total Contact Hours: 56	**No. of Credits: 04**
L:T:P	**4:0:0**
Internal Assessment Marks: Theory:20	**Duration of SEE:** 03 Hours
Semester End Exam Marks:	**80**

Course Outcomes (CO's):

1. Periodic properties of coordination compounds with bonding nature and redox reactions will be taught
2. Elementary aspects of organic compounds like aldehydes and some organic reactions will be taught
3. Importance of colligative properties, phase equlibria and solutions aspects will be taught
4. Principles and basics of spectroscopy like FTIR, UV and NMR spectroscopy will be taught

At the end of the course, students shall be able to:

1. Understanding the importance of coordination compounds.
2. Understanding the preliminary aspects of organic compounds and its reactions.
3. Explain the importance of colligative properties, phase equlibria and solutions

UNIT-I: INORGANIC CHEMISTRY-1II **14 Hours**

Coordination Compounds **06 hours**

Introduction, Complexes & double salts, Werners theory of complexes,Types of ligands with examples. Coordination Number and geometry of complexes, Factors affecting stability of complexes.

Isomerism in coordination compounds: structural & Stereoisomerism in coordination number 4 & 6 complexes.

Metal Ligand Bondings **05 hours**

Sidgwick's theory, Concept of Effective Atomic Number(EAN) rule & limitations.

Valance bond theory(VBT): Postulates & concept, Application of VBT to tetrahedral & octahedral complexes, Limitations of VBT.

Crystal Field Theory(CFT): Salient features, application of CFT to tetrahedral & octahedral complexes, Crystal field stabilization energy, Factors affecting CFSE, Colours& magnetic properties, limitations of CFT.

Redox Reactions **03 hours**

Redox potentials, Standard redox potentials, redox cycle, Redox stability in water-Oxidation & reduction of water, Potential energy diagrams: Latimer diagrams, Frost diagrams and Porbaux diagrams (application in corrosion process)

UNIT-II:ORGANIC CHEMISTRY-1V **14 Hours**

Aldehydes& Ketones **03 hours**

Preparation of aldehydes & ketones from alcohols and alkynes. Mechanism of nucleophilic addition of HCN and $NaHCO_3$ to aldehydes and ketones.

Mechanism of condensation reactions- acetaldehyde & acetone with NH_2OH, NH_2NH_2 & phenyl hydrazine, Wolf –Kishner reaction(mechanism not expected)

Nitro Compounds & Amines **4 Hours**

Reduction of Nitrobenzene in acid, alkaline and neutral medium.

Amines: Basic Character of amines, Comparison of basic character of primary, secondary and tertiary amines with examples, reaction of amines with HNO_2 ;

Diazonium salts, application of diazonium salts in organic synthesis

Organic Reactions **07 Hours**

Formation, stability and reactions of i)Carbocations: dienone-phenol .ii) Carbanions: Perkins reaction (mechanism), Aldol condensation, Claisen- Schmithcondensation,iii) Carbenes & Nitrenes: Singlet and triplet states, relative stability iv) Arynes: Formation and reactivity.

UNIT-III: PHYSICAL CHEMISTRY-IV **14 Hours**

Phase Equilibria **05 hours**

Introduction, Statement & meaning of terms: Phase, Component & Degrees of freedom, Derivation of Phase rule, Significance of curves, Area and triple point. Application of Phase rule toi) One component System- water ii) Two component system- Lead- Silver system and KI-Water System, Freezing mixtures. Solid Solutions-Mg-Zn system.

Colligative Properties **06 Hours**

Introduction, Osmotic Pressure, determination, Laws of Osmotic Pressure

Lowering of Vapour pressure, Raoults law statement, calculation of molar mass.

Elevation of boiling point & its relation with relative lowering of vapour pressure, Ebullioscopic constant of solvent Derivation from Clapeyron- Clausius equation, determination of molar mass of solute by Landsberger method.

Depression in Freezing Point, Cryoscopic constant of solvent, Derivation from Clapeyron-Clausius equation,

Abnormal colligative properties &vant Hoff factor.

Solutions **03 Hours**

Ideal & Non ideal solutions, Binary mixtures of completely miscible liquids, Deviation from Raoult's law, vapour pressure-composition and Boiling point-composition curves

Azeotropic mixtures,

Partially miscible liquids: Critical solution temperature (CST)- Phenol-water, Triethyl amine-water and Nicotine-water systems.

UNIT-IV: Spectroscopy: 14 Hours

Electromagnetic radiation (EMR): Properties, Interaction of EMR with matter, relaxation process.

UV spectroscopy: Introduction, Principle, Beer-Lambert law, Limitations and also auxochrome chromophore theory. Instrumentation, Quantitative applications,

FT-IR Spectroscopy: Introduction, Principle, Instrumentation, Application to the identification of functional groups.

H NMR Spectroscopy: Introduction, Principles & theory, Instrumentation, chemical shift, Applications: Simple organic compounds like hydrocarbons an alcohols.

Semester - IV

Course Title: Chemistry Laboratory Course-IV	**Course Code: 24MJCH4P**
Total Contact Hours: 54	**No. of Credits: 02**
L:T:P	**(0,0,4)**
Internal Assessment Marks: Theory:10	**Duration of SEE:** 3Hours
Semester End Exam Marks: 40	**Contact Hrs Week: 04 Hours**

Course Outcomes (CO's):

1. To prepare required chemical solution.
2. To prepare some organic compounds.
3. To impart skills related to preparation of stock and working solutions and handling of instrumental methods
4. To know the principle of conductometer and its application
5. To know the principle of viscometer and determination of viscosity

At the end of the course, students will be able to:

1. Understand the importance of instrumental methods for quantitative applications.
2. Learn the importance of preparation methods and also estimation of organic compounds.

LABORATORY COURSE

Minimum 10 experiments

Physical Chemistry Experiments:

1. Determine the critical solution temperature of phenol-water system
2. Determine the percentage of NaCl solution using phenol in water
3. Determination of molecular weight of non-volatile solute by Rast method
4. Determination of molecular weight of non-volatile solute by ebullioscopic method
5. Study of adsorption on activated charcoal.
6. Determination of transition temperature of $CaCl_2$ by thermometric method.
7. Determination of percentage composition of Glycerol-water by Viscometer method
8. Determination of unknown composition of Cu^{++} in copper sulphate solution and verify Beer-Lamberts law by colorimetric method.

Organic Chemistry Experiments:

1.Estimation of water soluble carboxylic acid by titration method.
2. Estimation of phenol by bromination method.
3. Estimation of aldehyde and ketone
4. Determination of saponification value of an oil or fat.
5. Determination alkali content in antacid tablet.

Semester - IV

Course Title: Food Chemistry (Open Elective)	**Course Code: 24MJCH4S**
Total Contact Hours: 28	**No. of Credits: 02**
L:T:P	**2:0:0**
Internal Assessment Marks: Theory:10	**Duration of SEE:** 02 Hours
Semester End Exam Marks:	**40**

Course Outcomes (CO's):

1. Importance of chemistry behind the food will be taught
2. Elementary aspects of content of food and its processing will be taught
3. Importance of water in food and food adulterants will be taught

At the end of the course, students shall be able to:

1. Understanding the importance of food and its compounds.
2. Understanding the preliminary aspects of food and its processing.
3. Explain the importance of food adulterants in our daily life

Unit I

Introduction to Food Chemistry: 08 hours

Definition & scope, importance, Food as a system: cellular basis of plant, microbial & animal sources, physiology of vegetables & fruits, water activity.

Basic principles & roles of food production, processing & quality attributes

Unit II:

Components of Food 10 hours

Major food components: i) Carbohydrates- Definition, classification, examples. Function in foods as energy sources, structure & textures- Glucose, fructose & starch as examples. Processing & storage.

ii) Proteins: Amino acids, peptide bond elementary idea of structure, Functions in food & nutritional role, denaturation of proteins and coagulation.

iii)Lipids: Definition, fatty acids, triglycerides, phospholipids & sterols. Edible fats & oils, Functions in food- energy, structure & flavor. Oxidation & rancidity

iv) Minerals in food: main elements, trace & ultra trace elements 4 examples each & their functions, nutritional role of minerals

Unit III

Role of water in food: 10 hours

Elementary idea on structure of water, As solvent, reactant, water activity, influence on microbial growth and food spoilage. Determination of moisture content

Food Additives:

vitamins, amino acids & minerals, Aroma compounds and Colour agents, effect of food additives on preservation , health & toxicity

Food Analysis:

Reasons for food analysis, Analysis of mixtures in vegitable oils & spices,. Analysis of ash in honey, analysis of crude fibres in spices & condiments. Food adulteration: Common adulterants

in food. Contamination of food stuffs. Common micro organisms of food stuffs. Pesticide analysis in food products by TLC technique

Semester - V

Course Title: Chemistry-V	**Course Code: 24MJCH5L**
Total Contact Hours: 56	**No. of Credits: 04**
L:T:P	**4:0:0**
Internal Assessment Marks: Theory:20	**Duration of SEE:** 03 Hours
Semester End Exam Marks:	**80**

1. Periodic properties of acid – base compounds, HSAB concepts and nuclear chemistry will be taught
2. Elementary aspects of organic synthesis and natural products will be taught
3. Importance of photochemistry and quantum mechanics aspects will be taught
4. Importance of some environmental aspects will be taught

At the end of the course, students shall be able to:

1. Understanding the importance of basic inorganic compounds.
2. Understanding the preliminary aspects of organic synthesis and natural products.
3. Explain the importance of photochemistry and quantum mechanics

Unit – I: Inorganic Chemistry **14 Hours**

Main group chemistry and acid – base concept: **03 Hours**

chemistry of main group elements – structure and bonding in borans. Carboranes, metalocarboranes, wades rules, borazines, phosphozenes, S.N – compounds. Silicates – classification, structures, isomorphous replacement, pyroxenes, layered and vitreous silicates, zeolites and molecular sieves.

HSAB concept : **03 Hours**

Basin of HSAB concept, acid – base strength, hardness and softness, symbiosis, applications of HSAB concept: Acid – base concept in non-aqueous media, reactions in Br F_3, N_2O_4, anhydrous H_2So_4, CH_3COOH, Isopoly and heteropoly acids of W, Mo and V Preparations, properties structure and application.

Nuclear chemistry : **08 Hours**

The atomic nucleus – elementary particles, quarks, classification of nuclides besed on Z and N values, nuclear stability, nuclear potential, Binding energy. Nuclear models: shell model salient feature, forms of the nuclear potential, filling orbitals, nuclear configuration, liquid drop model Fermidirac model, collective model and optical model. Radioactivity, radioactive decay kinetics, parent - daughter decay growth relationship secular and transient equilibrium, theories of a, B -, B+, and y decay, internal conversion. General principles and introduction to absorption and emission spectroscopy.

Unit – II Organic Chemistry **14 hours**

Organic synthesis via Enolates **03 hours**

Reactive methylene compound – introduction Acidity of a – H atoms in ethyl

acetoacetate. Synthesis of ethyl acetoacetate (mechanism of Claisen condensation). Keto–enol tautomerism in ethylacetoacetate. Synthetic applications of ethyl acetoacetate.

Carbohydrates. **04 Hours**

Introduction and classification, mechanism of osazone formation. Interconversion of glucose into fructose and vice – versa, chain lengthening in aldoses (Killiani – Fischer synthesis). Chain shortening in aldoses (Ruff degradation) Epimerization and mutarotation. Elucidation of open – chain structure of D – glucose. Cyclic structures of glucose (Fischer & Haworth representation).

Oils, fats, soaps and detergents. **07 Hours**

Oils & fats – composition of oils & fats. Determination of saponification number ad iodine number of oils & fats.

Soaps – introduction, manufacture of soap by hydrolyser process (Modern continuous process)

Synthetic detergents (syndets) – Introduction, synthesis of sodium lauryl sulfate and sodium dodecyl

benzene sulfonate. Cleaning action of soaps.

Synthetic polymers :

Definition, classification with examples. Synthesis and uses of Teflon, nylon and terylene. Thermoplastic & thermosetting polymers.

Synthetic dyes

Introduction, classification of dyes based on structure. Chromosphore & oxochrome theory of color & constitution, synthesis of methy1 orange, Bismarck brown & malachite green.

Unit : III Physical Chemistry **14 Hours**

Photochemistry **09 Hours**

Photochemical and thermo chemical reactions, definition, examples. Differences.

Law of photochemistry : Grothus – Draperis law, Lamberts law beers law, Absorption coefficient, Extinction coefficient and their significance. Molar absorption coefficient, molar extinction coefficient and their signification. Einstein's law of photochemical equivalence. (Problems based on only Einstein's law). Quantum yield : high and law quantum yield reasons for the deviation. Primary and secondary.

a) Decomposition of HI b) Combination of H_2 and Br_2 c) Combination f H_2 and Cl_2

Chemiluminiscence, florescence, phosphorescence, Photo inhibition and photo sensitization wit h examples.

Quantum mechanics: **05 Hours**

Concepts of operators : laplacian Hamiltonian, Linear and Hermitian operators. Angular momentum operators and their properties. Commutation of operators. Solutions of Schrödinger wave equation for a free particles, par ticle in a ring. Partical in a three 0 dimensional box. Quantum mechanical degeneracy . tunneling (no derivation) application of schrodinger equation to harmonic Oscillator, rigid rotator. Eigne functions and eidenvalues of angular momentum ladder operator method for angular momentum.

Unit IV

Analytical Chemistry **09 Hours**

Pollution: Types & sources of air pollution. Determination of particulates, So_x, NO_x, & Co_x water pollution – Different types of water pollutants. Ground water pollution, surface water pollution and marine water pollution. Impacts of water pollution on environment COD, BOD. Control of water pollution. Industrial effluents – their effects & treatment, sewage water treatment. Water & air quality standards (ISI & WHO)

Water Microbiology **02 Hours**

Water microbiology – types and sources of contamination – prevention of water borne diseases. Water management water harvesting, water recycling.

Semester - V

Course Title: Chemistry Laboratory Course-V	**Course Code: 24MJCH5P**
Total Contact Hours: 54	**No. of Credits: 02**
L:T:P	**(0,0,4)**
Internal Assessment Marks: Theory:10	**Duration of SEE:** 3Hours
Semester End Exam Marks: 40	**Contact Hrs Week: 04 Hours**

Course Outcomes (CO's):

3. To prepare and estimate some inorganic compounds.
4. To prepare some organic compounds.
5. To impart skills related to preparation of stock and working solutions and handling of instrumental methods
6. To know the principle of viscometer and determination of viscosity by viscometer
7. To know the principle of stegnometer and determination of surface tension by stelegnometer

At the end of the course, students will be able to:

1. Understand the importance of instrumental methods for quantitative applications.
2. Learn the importance of preparation methods and also determination of inorganic compounds.

Organic mixture separation and analysis of single compound.

- Separation of mixture containing two solid compounds. Analysis of any one compound with preparation of derivative.
- Minimum 11 mixtures are to be given for analysis.
- In the beginning two practical durations may be used for instructions and demonstration one mixture separation and analysis, Instructions should cover the basis of separation and reactions of elements tests and functional group tests.
- The mixtures may be A+N, P+N and B+N combinations.
  Acids : Benzoic, Salicylic, Cinnamic and pthalic acid.
  Phenols: a – naphthol, B- naphthol and resorcinol.
  Bases: p – Toluidine, o – toluidine, m – Toluidine,
  Neutrals: Naphthalene, Diphenyl, m – Dinitribenzene. Acetanilide.

Physical chemistry instrumental experiments

- In the beginning two practical durations may be used for instruction and demonstration. Instruction should cover theory and principle of each experiment.
- Minimum 11 experiments are to be given for practical exercise.

1. Conductometric titration of strong acid (HC1) against strong base (NaOH)
2. Conductometric titration of mixture of acids against strong base.
3. Conductometric titration of mixture of acids against strong base.
4. Determination of amount of Cu^{2+} in $CuSO_4$ solution and verify Beer – Lambert's law.
5. Estimation of HC1 by titrating with standard NaOH potentiometrically.
6. Estimate the amount of iron in ferrous ammonium suplhate by titrating with standard $K_2Cr_2O_7$ solution potentiometrically.
7. Determine the specific and molecular refractivities of two given liquids by Abbey's refractometer. And determine the densities of two given liquids.

8. Determine the specific rotation of cane – sugar solution using polarimeter.
9. Conductometric precipitation titration of NaC1 against $AgNO_3$.
10. Preparation of buffer solution and determination of their pH using pH meter
11. Estimation of vitamin C by UV spectrophotometer.
12. Potentiometric titration of acetic acid with NaOH and determination of dissociation constant of acetic acid quinhydrone electrode.

Course Title: Nanoscience	**Course Code: 24MJCH5E**
Total Contact Hours: 28	**No. of Credits: 02**
L:T:P	**(2,0,0)**
Internal Assessment Marks: Theory:10	**Duration of SEE:** 02 Hours
Semester End Exam Marks: 40	**Contact Hrs Week: 02 Hours**

Course Outcomes (CO's):

1. To Study the Importance of Nano Materials and its Chemistry.
2. To understand the characterization of Nano materials by various methods.
3. To study the structure and Morphology of Nano materials

At the end of the course, students will be able to:

1. Understand the importance of Nano Materials and its applications.
2. Learn the importance of characterization tools and structural behavior of Nano materials.

Unit I: **Chemistry of Nanomaterials** **10 Hours**

Introduction, Scope and importance of nanoscience, bulk and nanomaterials, Classification and Nomenclature of Nanomaterials, Different Methods of Synthesis of nanoparticals, top down and bottom of approach. Nanosized metals and alloys, semiconductors, ceramics–a comparison with respective bulk materials, carbon nanotubes, SWCNT, MWCNT, Organic semiconductors, carbon materials, quantum dots, quantum wells, quantum rods, quantum wires, quantum rings; bulk nanostructured, nanocomposites, nanomachines and devices.

Unit II: **Characteristics of Nanomaterials:** **10 Hours**

Nucleation and growth of nanosystems, selfassembly, functional nanomaterials and nanostructured thin films. Quantum confinement in semiconductors – particle in a box like model for quantum dots, origin of charge on colloidal sols, zeta potential, basics of thermodynamics and kinetics related to nanoparticles.

Unit III: **Structure and morphology of Nanoparticles**: **08 Hours**

Crystal structure of materials, packing fraction, basics of solid-state chemistry, specific surface energy and surface stress and effect on the lattice parameter. Nanoparticle morphology and morphology of supported particles. Morphology dependent properties of nanomaterials, Applications of morphological study,

Semester - VI

Course Title: Chemistry-VI	Course Code: 24MJCH6L
Total Contact Hours: 56	No. of Credits: 04
L:T:P	4:0:0
Internal Assessment Marks: Theory:20	Duration of SEE: 03 Hours
Semester End Exam Marks:	80

1. Properties of industrial materials and bioinorganic chemical aspects will be taught
2. Elementary aspects of edition, elimination, enzymes and hormones will be taught
3. Importance of thermodynamics aspects will be taught
4. Importance of some analytical techniques will be taught

At the end of the course, students shall be able to:

1. Understanding the importance of industrial materials and bioinorganic chemical aspects.
2. Understanding the preliminary aspects of edition, elimination, enzymes and hormones
3. Explain the importance of thermodynamics aspects and analytical techniques

Unit – I Inorganic Chemistry **14 Hours**

Industrial chemistry **05 Hours**

a) Cement – definition & composition of Portland cement, manufacture of Portland cement by dry process, setting of cement, types of Portland cement & other types of cement. Cement industries in India. 02 Hours

b) Glass – definition & composition, physical properties, chemical properties characteristics, manufacture of glass by pot furnace method. Types of glasses. 02 Hours

c) Paints & pigments – constituents of paints formulation of paints. Types of pigments, white lead : Manufacture, physical properties & uses. Setting of paint. 02 Hours

Bio – Inorganic Chemistry **07 Hours**

Macro elements. Micro elements (Trace elements) – Essential trace elements. Non – essential trace elements.

Metalloporphyrins, hemeprotins myoglobin and hemoglobin – structure and functions, oxygenation.

Metalloenzymes : Heme containing enzymes – carbonic anhydrate, carboxy peptidase, peroxides, cytochrome.

Inorganic chains, rings, cages and clusters

Silicates – Occurrence, classification and structure.

Intercalation compounds of graphite with alkali metals – properties and structure.

Sulfur nitrides – Preparation, properties and structure of S_4N_4,

Inorganic polymers. **02 Hours**

General characteristics of inorganic polymers. Types of inorganic polymers. Silicones – preparation. General properties, types and application. Polyphosphazenes.

Unit – 2 Organic Chemistry **14 Hours**

Addition reactions. **08 Hours**

Addition to carbon – carbon multiple bonds. Mechanistic and stereo chemical aspects of addition reactions involving electrophiles, nudeophiler and free radicals region stareo and chemoselectivitier Orientation and reactivity addition to cyclopropane ring Hydrogenation of double and triple bonds hydrogenation of aromatic rings. Hydrogenation of double and triple bonds hydrogenation of aromatic rings addition of alkenes and or alkynes to alkenes and / or alkynes Fne synthesis Michael reaction.

Rearrangements :

Wagner – meerwein, pinacol – pinacolne fries wolf Beckmann Hofmann curtius lassen and Schmidt rearrangements benzyl – benzilic acid rearrangement arndt – Eistert reaction tiffeneu – demijanaov reaction, firtsch – buttenbeng wiechell rearrangement. Stevens wittig and favorskii rearrangements Baeyer – villager oxidization neber rearrangement.

Study of natural products – alkaloids & Terpenes. **04 Hours**

Alkaloids : introduction, classification with examples. Elucidation of structure of nicotine and synthesis. Structural formula and uses of quinine and atropine.

Terpenes : introduction, classification isoprene rule. Elucidation of structure of citral and synthesis. Structural formula and uses of menthol and camphor.

Enzymes, Hormones and vitamins. **02 Hours**

Enzymes : Classification, characteristic properties of enzymes, mechanism of enzymatic action (lock and key theory and template hypothesis) & Coenzymes.

Hormones : Introduction classification with examples, hormone secreting glands (in human beings). Synthesis and importance of adrenaline. Biological importance of thyroxin insulin.

Unit – III Physical Chemistry **14 Hours**

Thermodynamics – I

Thermodynamics : Introduction, definition concepts of partial molar properties partial molar free energy, chemical potential partial molar volume and its significance, gibbs – Duhem equation gibbs – Duhem margulus equation determination of partial.

Molar volume : Graphical method. Intercept method and apparent molar volume method. Concept of fugacity determination of fugacity by graphical method and compressibility factor method. Activity and activity coefficient : Determination of activity wefficient by EMF and solubility method. Thermodynamics of non – ideal system – excess thermodynamic function GE, SE HE, etc.

Phase Rule : Derivation of phase rule form the concept of chemical potential. Application of phase rule of three

Components system : principle of triangular diagram plots for a mixture of three liquicls consistins of one two and three pairs of partially miscible liquids statistical thermodynamics objectives of statisfical thermodynamics concept of distributions. Types of ensembles.

Analytical Chemistry :

Food Analysis : Reasons for food analysis. Sampling procedure, Analysis of moisture in vegetable oils & spices. Analysis of ash in honey. Analysis of crude fibers in spices and condiments. Food adulteration common adulternats in food. Introduction to food contaminates, methods of preventing food contamination, methods of protein determination, Contamination of food stuffs. Common micro organisms of food stuffs. Pesticide in food products by TLC technique.

Oils & Fats : Introduction, meaning, Iodine value, Acid value, Rancidity

Analysis of milk for fat & added water .

Food preservatives – SO_2. Sulphides, benzoic acid, benzoates-detection, flavoring agents & coloring agents-detection with example.

Course Title: Medicinal Chemistry (Open Elective)	**Course Code: 24MJCH6E**
Total Contact Hours: 28	**No. of Credits: 02**
L:T:P	**(2,0,0)**
Internal Assessment Marks: Theory:10	**Duration of SEE:** 02 Hours
Semester End Exam Marks: 40	**Contact Hrs Week: 02 Hours**

Course Outcomes (CO's):

1. To Study the importance of drugs and its synthesis.
2. To understand the mechanism of drugs usage.
3. To Learn the importance of drug metabolism and its activation

At the end of the course, students will be able to:

3. Understand the necessity of drugs and its usage.
4. Learn the importance of drug mechanism and its effects in the treatment of disseizes.

Unit I : I Medicinal Chemistry : 10 Hours

introduction to chemotherapy. Different types of drugs with examples (Analgesics, Antiseprics, Antimalarials, antibiotics, tranquilizers). Synthesis and uses of aspiring paractamol and sulphanilamide.

Antibiotics: Defination, examples and importance. Synthesis of antipyrine and chloramines – T. Pesticide – types with examples. Synthesis and uses of gammexane.

Unit II : Receptorology and Enzymology: 10 Hours

Drug-receptor interactions, Receptor theories and drug action, Receptor Complexes and Allosteric Modulators, Enzyme kinetics in drug action, Mechanisms of enzyme catalysis, Coenzyme Catalysis, Drug action through enzyme inhibition, Theories of enzyme inhibition and inactivation, Enzyme activation of drugs and prodrugs

Unit III. Druglikeness: 08 Hours

Drug like molecules and theories associated with the recognition of drug like properties. Physical organic chemistry of drug metabolism, drug de-activation and elimination, Phase I and phase II transformations, Concept of hard and soft drugs, Chemistry of ADME and toxicity properties of drugs. Role of transporters, ion-channel, CYP in permeability (CaCo-2), drug resistance and ADMET properties

Semester - VI

Course Title: Chemistry Laboratory Course-VI	Course Code: 24MJCH6P
Total Contact Hours: 54	No. of Credits: 02
L:T:P	(0,0,4)
Internal Assessment Marks: 10	Duration of SEE: 3Hours
Semester End Exam Marks: 40	Contact Hrs Week: 04 Hours

Course Outcomes (CO's):

5. To prepare and estimate some inorganic compounds.
6. To prepare some organic compounds.
7. To impart skills related to preparation of stock and working solutions and handling of instrumental methods
8. To know the principle of viscometer and determination of viscosity by viscometer
9. To know the principle of stegnometer and determination of surface tension by stelegnometer

At the end of the course, students will be able to:

1. Understand the importance of instrumental methods for quantitative applications.
2. Learn the importance of preparation methods and also determination of inorganic compounds

Inorganic quantitative analysis.

- Theory of individual estimation & calculation of conversion factor is to be explained.
- Minimum 11 experiments are to be given for estimation.

Following experiments are to be given.

1. Estimation of Fe as Fe_2O_3 in ferrous ammonium sulphate.
2. Estimation of barium as barium sulphate in barium chloride solution.
3. Estimation of sulphate as barium sulphate in ammonium sulphate.
4. Estimation of Ni as Ni – DMG in Ni – ammonium sulphate solution.
5. Estimation of copper as cuprous thiocyanate.
6. Estimation of magnesium as magnesium oxinate in magnesium sulphate solution.
7. Estimation of chloride as silver chloride in sodium chloride.
8. Estimation of aluminium as aluminium oxide in aluminium sulphate.
9. Estimation of copper as copper oxide.
10. Analysis of stainless steel.
11. Analysis of time stone (SiO_2 by gravimetry & Ca by titrimetry)
12. Gravimetric analysis of Cu – Ni alloy.

Physical chemistry instrumental experiments

- In the beginning two practical duration may be used for instructions and demonstration. Instructions should cover theory and principles of each experiment.
- Minimum 11 experiments should be given for practical excercises.

1. Determination of equivalent conductance at infinite at infinite dilution of strong electrolyte.
2. Determination of degree of dissociation of weak electrolyte.
3. Determination of dissociation constant of weak electrolyte.
4. Determination of solubility & solubility product of a sparingly soluble salt ($BaSO_4$, AgC1, AgBr) by conductometric method.
5. Estimation of Fe by colourimetry.

6. Determination of percentage composition of liquid mixture by graph method using Abbey's refractometer.
7. Percentage composition by formula method using Abbey's refractometer.
8. Determination of pH of an unknown solution using quinhydrone or glass electrode by potentiometer.
9. Determination of ionic product of waterby E.M.F method at 25^0C.
10. Determine the pH of various mixtures of sodium acetate and acetic acid in aqueous solution and hence determine the dissociation constant of acetic acid.
11. Conductometric determination of the kinetic order of saponification of ethy1 acetate by NaOH.
12. Determination of equivalent conductance of weak electrolyte at infinite dilution following Kohlrausch's law.

References

INORGANIC CHEMISTRY

S.No.	Title & edition	Author/s	Year of publicn.	Publisher
1	Concise Inorganic Chemistry Fifth edition	J.D.Lee	1998	ELBS with Chapman & Hall
2	Basic Inorganic Chemistry Fourth edition	F.A.Cotton, G.Wilkinson		Wiley Eastern
3	Inorganic Chemistry Fourth edition	Shriver, Atkins & C.H.Longford		Oxford University press
4	Principles of Inorganic Chemistry As per UGC curriculam	Puri. Sharma.Kalia	2010-11	Milestone publishers & Distributors, Delhi.
5	Theoretical principles of Inorganic Chemistry	G.S.Manku	1990	TATA McGraw Hill Publishing company Ltd. New Delhi.
6	Chemistry for Degree students. For First year	Dr.R.L.Madan	2011	S.Chand & company P.Ltd. New Delhi.
7	Chemistry for Degree students. For Second year	Dr.R.L.Madan	2011	S.Chand & company P.Ltd. New Delhi.
8	Chemistry for Degree students. For Third year	Dr.R.L.Madan	2011	S.Chand & company P.Ltd. New Delhi.
9	Comprehensive Inorganic Chemistry for B.Sc.I year	Dr.Sulekh Chandra	2004	New Age International (P) Ltd.
10	Advanced Inorganic Chemmistry. Vol-I, 23rd Edition	Gurddep Raj	1997-98	Goel Publshing House, Meerut.
11	Text book of Inorganic Chemistry, second revised edition	K.N.Upadhyaya	1990	Vikas Publishing House Pvt. Ltd.
12	Analytical chemistry	Alka Gupta		
13	Quantitative Inorganic Analysis	A.I.Vogel		
14	Callister's Material Science & Engineering	Adapted by R.Balasubramanian		Wiley India (P) Ltd.
15	Industrial Chemistry	B.K.Sharma		
16	Environmental chemistry	Asim K.Das		
	Other useful Inorganic chemistry books			
15	Inorganic Chemistry	G.L.Miessler and D.A.Tarr		Prentice Hall
16	Inorganic chemistry	A.G.Sharpe		ELBS

17	Concepts and Models of Inorganic Chemistry, second editoin	Douglas, McDaniel & Alexander	1983	Vikas Publishing House Pvt. Ltd.

ORGANIC CHEMISTRY

1	A Text book of organic chemistry	Arun Bahl and B.S.Bahl		
2	Advance organic chemistry	Arun Bahl and B.S.Bahl		
3	A Text book of organic chemistry	K.S.Tewari and N.K.Vishnoi		
4	Reaction Mechanism and Reagents in organicchemistry	Gurdeep R.Chatwal		
5	Organic chemistry by	Morrison and Boyd		
6	Organic chemistry	L.G.Wade		
7	Organic chemistry Vol I, II, & III	Mukherji, Singh & Kapoor		
8	Organic chemistry	I.L.Finar		
9	Analytical chemistry	B.K.Sharma		
10	Organic chemistry	P.S.Kalsi		
11	Organic chemistry	Clayden		Oxford University press
12	A guide book to mechanism in organic chemistry	Peter sykes		
13	Environmental chemistry with green chemistry	Asim. K.Das		
14	Organic spectroscopy	William Kemp		
15	Stereochemistry	P.S.Kalasi		
16	Stereochemistry	Elil		
17	Environmental chemistry	A.K.De		
18	Organic chemistry	Bruice		
19	Organic reaction mechanisms	Nasipuri		
20	Organic reaction mechanisms	P.S.Kalasi		

PHYSICAL CHEMISTRY

1	Physical chemistry7th edition	P.W.Atkins & Julio dePaula	2002	Oxford University press
2	Elements of physical chemistry 3rd edition	Peter Atkins	2000	Oxford University press
3	Physical chemistry-A molecular approach	Donald A, Macquarie & John D.Simon	2001	Viva Low priced student edition
4	Introduction to physical chemistry 3rd edition	Mark Ladd	1999	Cambridge Low Priced edition

5	Text book of physical chemistry	S.Glasstone	1982	Mcmilan India Ltd.
6	Principles of physical chemistry	B.R. Puri, L.R.Sharma & M.S.Pathania	1987	S.L.N.Chand & Co.
7	Text Book of Physical Chemistry	P.L.Soni	1993	S.Chand & Co.
8	Physical chemistry	Alberty R.A. & Silbey	1992	R.J.John Wiley & Sons
9	Physical chemistry	G.M.Barrow	1986	McGraw Hills
10	Physical chemistry 3rd edition	Gilbert W.Castilian	1985	Narosa Publishing House
11	Text book of polymer Science	BilMeyer. Jr	1984	John Wiley & Sons
12	Basic Physical Chemistry	Walter J.Moore	1972	Prentice Hall
13	Physical chemistry	Gurdeep raj		Goel Publications

For Laboratory Experiments

1	Vogel's Text book of qualitative chemical analysis	J.Basset, R.C.Denney, G.H.Jaffrey and J. Mendham	1986	ELBS
2	Inorganic semi micro qualitative analysis	v.v.Ramanujam	1974	National pub.Co.
3	Practical Inorganic chemistry	G.Marr, B.W.Rackett, Von Nostrand, Reinhold	1972	
4	Laboratory manual of Organic Chemistry	Day, Sitaraman and Govindachari	1998	
5	Text book of practical organic chemistry	A.I.Vogel	1996	
6	A Hand book of organic Analysis	Calrke and Hayes	1964	
7	Findlay's Practical physical chemistry	Levitt,	1968	ongman'sLondon
8	Experiments in physical chemistry	Shoe maker & Garland	1986	McGraw Hill Int. edn.
9	An Introductioin to Practical Biochemistry	David Plummer	1992	McGraw Hill Pub. Co.
10	Introduction to practical Biochemistry	S.K.Sawlmey & Ranadhir Singh	2000	Narosa Pub. House
11	Advanceed Practical Chemistry	Jagadamba Singh, R.K.P.Singh etc.	2008	Pragathi Pub. Meerut
12	Advanced Experimental chemistry I, II, III	J.N.Gurtu & R.Kapoor	1986	S.Chand & Company Ltd.

Evaluation Process:

A. Continuous Assessment Scheme (Major Courses): Internal

Sl. No.	**Component**	Maximum Marks
01	Two Session Tests with proper record for assessment (5+5 = 10)	10
02	Assessment of Skill development activities/Seminars/Group Discussion etc., with proper record	05
03	Assignment with proper record	05
AL		**20**

B. Elective / SEC Courses: Internal

Sl. No.	Component	Maximum Marks
01	Two Session Tests with proper record for assessment	05
02	Assessment of Skill development activities/Seminars/Group Discussion etc., with proper record	05
TOTAL		**10**

C. Internal Assessment for Practical: Internal

1	Test with proper record for assessment	05
2	Record / Journal	05
Total		**10**

D. Practical Semester End Examination External (Duration: 3Hrs)

No	Component	Maximum Marks
1	Circuit Diagram/Ray diagram/Tabular Column with proper labeling and units.	10
2	Experimental Skill (proper readings)	12
3	Graph/calculations/Result with Accuracy	08
4	Viva	10
	Total Marks	**40**

E. Project Work Assessment during VI semester: Internal

1	Regular project progress assessment	05 Marks
2	Presentation	05 Marks
Total		10 Marks

F. Semester End examination assessment for Project

1	Project Report	20 Marks
2	Final Presentation	10 Marks
3	Viva Voice	10 Marks
Total		40 Marks

QUESTION PAPER PATTERN: DSC Subjects

B.Sc. Third/ Fourth/Fifth/Sixth Semester Degree examination Subject: CHEMISTRY

Time: 3 Hours **Max. Marks: 80**

Section: A

Q.No	Explanation	Unit	Marks
1	Answer any ten questions of the following		**2x10=20**
a	2 Marks question	I	
b			
c			
d	2 Marks question	II	
e			
f			
g	2 Marks question	III	
h			
I			
j	2 Marks question	IV	
l			
m			

Section B

Answer all the questions 15x4= 60

Q. No	Explanation	Unit	Marks
2	Answer any three of the following	I	**5x3=15**
a	Each question 5 Marks		
b			
c			
d			
e			
3	Answer any three of the following	II	5x3=15
a	Each question 5 Marks		
b			
c			
d			
e			
4	Answer any three of the following	III	5x3=15
a	Each question 5 Marks		
b			
c			
d			
e			
5	Answer any three of the following	IV	5x3=15
a	Each question 5 Marks		
b			
c			
d			

QUESTION PAPER PATTERN: OE Subjects
B.Sc. Third/ Fourth/Fifth/Sixth Semester Degree examination
Subject: CHEMISTRY
Time: 2 Hours **Max. Marks: 50**

Explanation	Unit	Marks
Answer any seven questions of the following		
Three questions: Each question of 2 Marks	I	
Three questions: Each question of 2 Marks	II	
Three questions: Each question of 2 Marks	III	**2x7=14**

Section B

Answer any seven questions	Unit	Marks
Three questions: Each question of 5 Marks	I	15
Three questions: Each question of 5 Marks	II	15
Two questions: Each question of 5 Marks One questions: Each question of 6 Marks	III	16