Placed at the meeting of
Academic Council
held on 27.08.2009

APPENDIX - C

MADURAI KAMARAJ UNIVERSITY

(University with Potential for Excellence)

CHOICE BASED CREDIT SYSTEM
B.Sc., CHEMISTRY (SEMESTER)

COURSE SCHEME & SCHEME OF EXAMINATIONS
(Effective from the academic year 2008 – 2009 onwards)

Qualification :Passed in H.Sc.,or any other Examination accepted by the Syndicate as Equivalent

Duration of the Course :B.Sc., Chemistry - 3 years (6 – Semesters)

OBJECTIVES OF THE COURSE :

1. To enable the students to understand the knowledge of chemistry.
2. To acquire skills in the field of life oriented, application oriented and job oriented chemistry.
3. Study of skill based subject can develop various skills in the field of chemistry which will enable the students to get a job.
4. Visit to various chemical industries by the student will create a sound knowledge in the field of Industrial Chemistry
5. Study of Industrial Chemistry and Visit to industry helps for linking of Colleges with industry

SUBJECTS OF STUDY :

1. Part – I - Tamil
   Part – II - English
   Part – III i) Core Subjects – Chemistry
   ii) Allied Subjects
   Part - IV i) Non-major subjects
   ii) Skill based Subjects
   iii)Environmental Studies
   iv)Value Education

STRUCTURE OF THE QUESTION PAPERS :

Internal – 25 marks
External – 75 marks
Total 100 marks

Question Paper : Three Parts A, B and C

Section – A - 10 x 1 = 10 marks (multiple choice, True or False)
Section - B - 5 x 7 = 35 marks (either A or B)
Section - C - 3 x 10 = 30 marks (3 out 5 questions)

1. For Internal Examination : 25 marks

1. Two Tests to be conducted	- 15 marks (average of 2 tests to be taken)
2. Group discussion / Seminar / Quiz	- 5 marks
3. Two Assignments / Project	- 5 marks each (average of 2 to be taken)
4. Ist Internal Examination	- between 30th and 40th working days
5. IInd Test will be conducted	- between 70th and 80th working days
6. Eligibility for the degree	- passing minimum is 35%

External Examination = 75

Passing Mark	:	No minimum for internal exam.
	:	Minimum 23 for External

I Semester

Part	Study component	No. of Course	Credits	Hours
I	Tamil /Other Languages	1	3	6
II	English	1	3	6
III	**Core subject– 1** Inorganic Chemistry – I	1	4	4
	Core practical-I	1	-	2
	Allied Subject – I - paper 1	1	4	4
	Allied Subject –I- practical-I	1	-	2
IV	**Skill based subject** 1. Sugar Technology 2. Perfume Chemistry	1	2	2
		1	2	2
	Non Major Elective Industrial Chemistry	1	2	2
Total		9	20	30

II Semester

Part	Study component	No. of Course	Credits	Hours
I	Tamil /Other Languages	1	3	6
II	English	1	3	6
III	**Core subject– 2** Organic Chemistry - I	1	4	4
	Core practical-I	1	2	2
	Allied Subject – I - paper 2	1	4	4
	Allied Subject –I – practical-I	1	1	2

IV	**Skill Based Subject** 1. Leather Technology 2. Paper and Pulp Technology	1 1	2 2	2 2
	Non Major Elective Drugs and cosmetics	1	2	2
Total		9	23	30

III Semester

Part	Study component	No. of Course	Credits	Hours
I	Tamil /Other Languages	1	3	6
II	English	1	3	6
III	Core subject -3 Physical Chemistry – I Core practical-II	1 1	4 -	4 2
	Allied Subject - I - paper 3 Allied Subject –I- practical-2	1 1	4 -	4 2
	Allied Subject -II - paper 1 Allied Subject –II- practical -1	1 1	4 -	4 2
Total		8	18	30

IV Semester

Part	Study component	No. of Course	Credits	Hours
I	Tamil /Other Languages	1	3	6
II	English	1	3	6
	Core Subject -4 Inorganic Chemistry – II Core practical-2	1 1	4 2	4 2
	Allied Subject – I - paper 4 Allied Subject -I- practical- 2	1 1	4 1	4 2
	Allied Subject - II - paper 2 Allied Subject -II- practical- 1	1 1	4 1	4 2
Total		8	22	30

V Semester

Part	Study component	No. of Course	Credits	Hours
III	Organic Chemistry - II(Cr.-5) Physical Chemistry –II(Cr.-6) Inorganic, Analytical and Applications of Computers in Chemistry -III(Cr-7) Core practicals-3,4 and 5	3 3	12 -	12 8
	Allied Subject - II - paper 3 Allied Subject –II- practical-2	1 1	4 -	4 2

IV	Environmental Studies	1	2	2
	Skill based Subject Pharmaceutical & Medicinal Chemistry	1	2	2
Total		10	20	30

VI Semester

Part	Study component	No. of Course	Credits	Hours
III	Organic Chemistry –III(Cr.8) Physical Chemistry – III(Cr.9) Applied Chemistry – III(Cr.10)	3	12	12
	Core practicals-3, 4 and 5	3	15	8
	Allied Subject - II – paper 4	1	4	4
	Allied Subject –II- practical-2	1	1	2
IV	Value Education	1	2	2
	Skill based subject Medical Laboratory Technology & Bio Chemistry	1	2	2
V	Extension Activities	1	1	0
Total		11	37	30

I SEMESTER

Core Subject Paper –I

INORGANIC CHEMISTRY - 1

Credit -4
(15 x 4 = 60 hrs)
Max 100 Marks
Ext : 75
Int : 25

Unit - I

A. Laboratory hygiene and safety - Storage and handling of chemicals - Carcinogenic chemicals - Toxic and poisonous chemicals - Waste disposal - Fume disposal - General precautions for avoiding accidents - First aid techniques – Poisoning - methods to avoid poisoning - Treatment for specific poison laboratory safety mfueasures.

B. Principles and techniques of semi micro methods - Aims of semi micro qualitative analysis - Types of reactions involved in qualitative analysis – Dry reactions - Precipitation reactions-applications of solubility product principle in qualitative analysis - Complexation reaction - Oxidation and reduction reactions - Spot tests - Preparation of solution for cation testing on semi micro scale - Removal of interfering ions in the analysis of cations – Oxalate, tartrate, borate, fluoride, chromate, phosphate and arsenite.

C. Oxidation – reduction : Concepts of oxidation-reduction in terms of oxidation number – calculation of oxidation number – redox reactions – half reactions – Balancing ionic equations by ion electron method (half reaction) - Reactions involving - $Cr_2O_7^{2-}$ and Fe^{2+} - MnO_4^- and Fe^{2+} -$Cr_2O_7^{2-}$ in acid medium - CrO_4^{2-} and SO_3^{2-}

Unit II

Periodicity of properties – cause of periodicity – atomic and ionic radii – electron affinity – ionisation energy – electronegativity – Pauling and Mullikan scale –

Allred and Rochow's scale – factors affecting the magnitude of electronegativity - application of electronegativity.

Unit – III

Chemical bonding – valence bond approach – types of overlapping and orbital diagrams – sigma and pi bonds. Hybridization and geometry of molecules – sp, sp^2, sp^3, sp^3d and d^2sp^3 hybridization with example, VSEPR theory – shapes of molecules – molecular ortibal theory – Bonding and antibonding orbitals relative order of energies of molecular orbitals – MO theory applied to homonuclear molecules – H_2, O_2, F_2 and Cl_2 – heteronuclear molecules – HF, CO and NO - comparative study of VB and MO theories.

UNIT IV

Lattice energy of ionic compounds – Definitions - Experimental determination of lattice energy – Born Haber cycle - Explanation of some properties of ionic crystals on the basis of lattice energy - Fajans rule – van der waals forces - Ion-ion, ion-dipole interactions.

UNIT V

Halogens – position of halogens in the periodic table – anomalous behaviour of fluorine – modern method of isolation of fluorine – estimation of available chlorine in bleaching powder – properties and uses – perchloric acid – potassium perchlorate. Oxides and oxy acids of bromine – brominating mixture – periodic acid – preparation – properties – uses – inter halogen compounds – polyhalides – pseudohalogens – basic iodine.

Text Book;

1. Text Book for Inorganic Chemistry by Puri and Sharma. (Latest Edition2008)
2. Text Book for Inorganic Chemistry by P.L.Soni. (Latest Edition 2008)

Part IV:

Skill based subject

Sugar Technology

Credit - 2
Hours - 2
Max - 100
Ext. - 75
Int. - 25

Unit – I	Sugar Industry in India – Sugarcane and Sugar Beet – Manufacture of cane sugar
Unit - II	Extraction of Juice – Concentration – Separation of crystals – Recovery of glucose from molasses Defection.
Unit – III	Sulphitation and carbonation – Testing and Estimation of Sugar
Unit – IV	Double Sulphitation Process
Unit – V	Preparation of Bagasse – Use of Bagasse for manufacture of paper and electricity Preparation of Alcohol from Molasses . Preparation of Absolute Alcohol Manufacture of Wine, Beer, Methylated Spirit , Power Alcohol , estimation of No. of Hyroxyl groups.

Remark

Paper production from baggasse.
ethyl alcohol production from Molasses.

Visit to a Industry and submission of Report. For industrial visit / Assignment = 5 marks (Internal). Contact District Industrial Centre. (DIC for visits).

Text Book : Industrial Chemistry including Chemical Engineering - B.K.Sharma – Goel Publishing House. 13th Revised and Enlarged Edition

Production of anhydrous

Energy potential of Bagasse.

PART IV

SKILL BASED SUBJECT
PERFUME CHEMISTRY

Credit - 2
Hours -2
Total Marks: 100
Internal: 25
External: 75

Paper III:	**Perfume Chemistry**
Unit – I	Introduction – Esters, Alcohols, Ketones,
Unit – II	Diphenyl Compounds – Production of natural perfumes – flower perfumes
Unit – III	Jasmine – Lily, Orange blossom,- Rose – fruit flowers
Unit – IV	Artificial flavours
Unit – V	Banana Compounds – Grape Compounds, apple compounds and Pine apple compounds (Demonstration of Jasmine Perfume)

Visit to a Industry and submission of Report. For industrial visit / Assignment = 5 marks (Internal). Contact District Industrial Centre. (DIC for visits).
Text Book : Industrial Chemistry including Chemical Engineering - B.K.Sharma – Goel Publishing House. 13th Revised and Enlarged Edition

PART IV **Non-major elective**

Credit-2
Hours -2
Total Marks: 100
Internal: 25
External: 75

Industrial Chemistry

Unit – I

Industrial Chemistry – Scope – Various type of chemical industries – Fertilizers – Agricultural – Polymer – Cement – Petrochemical – Organic chemicals etc.

Milk and Milk Products Industry : Composition of Milk. Flavour and aroma of Milk, Physical properties of milk. Effect of heat on milk, Milk products; cream, Butter, ice cream, Milk Powder.

Unit – II

Agricultural Industry – Nutrients for plants – Major and minor nutrients – Role of NPK – Urea – Super Phosphate – Mixed fertilizers – Fertilizer manufacturing units in India – Insecticides and pesticides – DDT. Health Hazards of pesticides.

Unit – III

Polymer Industry – Natural and Synthetic rubbers – examples for synthetic rubber – applications – Plastic – Bakelite – Nylon 66 – PVC – Uses (Structure not necessary)

Unit – IV

Petrochemical industry : Crude oil – Chemicals from crude oil – Natural gas – LPG, Aviation fuel – Fuels used in locomotives – trucks and ships – Fuels used in light commercial vehicles – Air pollution problems due to Automobiles, and its control.

Unit – V

Nuclear Power Plants – Nuclear Power plants in India – Nuclear fuels – Concepts of Nuclear fission and energy production – Nuclear waste disposal and hazards.

Soap and detergents : Manufacture of Soap and Detergents. Cleaning action of soap.

Problems of Detergents Waste water in water resources.

Visit to various nearest industries and submission of report – 5 marks

Text Books:

1. Industrial chemistry including chemical Engineering. 2007. B.K. sharma Goel Publishing. House 13th Revised and enlarged edition.
2. Applied Chemistry – K.Bagavathi Sundari, S. Chand. 2007.
3. Fundamental concepts of Applied chemistry by Jaya Shree GhosH – S year 2008. Chand Company.

II SEMESTER

Core Subject Paper –2

ORGANIC CHEMISTRY - I

Credit -4
(15 x 4 = 60 hrs)
Max 100 Marks
Ext : 75
Int : 25

Unit I

a. **Polyhalogen derivatives** : Chlorofluoro carbons- westron and freon- preparation and applications. Preparation and properties of $CHCl_3$, CHI_3 and CCl_4.

b. **Organometallic compounds** : Grignard reagents- preparation, structure and synthetic applications, limitations. Organozinc, organocadmium and organolithium compounds.

Unit II

a. **Alcohols**: Preparation by hydroboration, reduction of carbonyl compounds, acids and esters, by using Grignard reagents. Reaction with metals. Mechanism and reactivity towards HX, dehydration- rearrangement. Ascending and descending the alcohol series-estimation of no. of hydroxyl groups.

b. **Ethers**: mechanism of Williamson's synthesis, mechanism of cleavage by HX - estimation of methoxy group by Zeisel method. Application of crown ethers.

c. **Thioalcohols and thioethers** : Preparation and properties of sulphonal and mustard gas. Phosphorus ylides- Definition with examples, mechanism of Wittig reaction.

UNIT III

Stereoisomerisms

a. **Geometrical isomerism** : Definition - geometrical isomerism of maleic and fumaric acids - aldoximes and ketoximes – determination of configuration of geometrical isomers - E, Z notations – stereochemistry of addition of bromine to double bond.

b. **Optical isomerism :**

(i) Optical activity – specific rotation and its polarimetric determination – definition of optical isomerism – elements of symmetry.

(ii) Optical isomerism of compounds containing asymmetric carbon atom – racemisation and resolution of racemic mixtures - Walden inversion – asymmetric synthesis. Chirality – specifications of absolute configuration by R and S notations.

(iii) Optical activity of compounds without asymmetric carbon atoms; allenes, spiranes and biphenyl compounds.

(iv) Optical activity of elements other than carbon atoms. Quaternary ammonium compounds and tertiary amine oxides.

UNIT-IV

CARBOHYDRATES:

a. Disaccharides: preparation, properties constitution and configuration of sucrose and maltose. Polysaccharides: A general study of starch and cellulose- uses of cellulose in industries.

UNIT-V

. Dyes : Definition – theory of colour and constitution – classification of dyes according to structure and applications.

(i) Azodyes - preparation of methylorange congo red and bismark brown

(ii) Triphenyl methane dyes : Preparation of malachite green, rosaniline and crystal violet

(iii) Phthalein dyes : Phenolphthalein, fluorescein and eosin preparation and properties

(iv) Vat dyes – preparation of Indigo.

Text Book :

Test Book of organic Chemistry by P.L. Soni. 2008 Latest Edition.

PART IV - SEMESTER II

Skill Based Subject

LEATHER TECHNOLOGY

Credit – 2
Hours -2
Total Marks: 100
Internal: 25
External: 75

Unit – I History of tanning industry in India – Conventional tanning process – Animal skin

Unit – II Manufacture of leather, preparation of hides for tanning, use of various inorganic and organic chemicals for tanning process

Unit – III Various processes of tanning – soaking, liming, deliming, dehairing, and bating

Unit – IV Vegetable tanning, type of tanning for soles, belting and heavy leather

Unit – V Vegetable tanning – synthetic tanning, chrome tanning, finishing of leather.

Environmental Pollution

Pollution problems caused by tanneries and its control

Treatment of tannery effluents by primary Secondary and tertiary processes, Use of reverse Osmosis system. for the treatment of polluted water.

Visit to a Industry and submission of Report. For industrial visit / Assignment = 5 marks (Internal). Contact District Industrial Centre. (DIC for visits).

Text Book : Industrial Chemistry including Chemical Engineering - B.K.Sharma – Goel Publishing House. 13th Revised and Enlarged Edition

PART IV - SEMESTER II
SKILL BASED SUBJECT

Sch & Sl 2

PAPER AND PULP TECHNOLOGY

Credit -2
Hours - 2
Total Marks: 100
Internal: 25
External: 75

Unit – I	Introduction, Manufacture of Pulp, Various raw materials used for the preparation of Plup.
Unit – II	Preparation of Sulphite Pulp, soda pulp, Rag Pulp
Unit – III	Various processes : Beating, Refining, Filling sizing and colouring
Unit – IV	Manufacture of paper, calendaring , uses
Unit – V	Various Paper industries in India

Visit to a Industry and submission of Report. For industrial visit / Assignment = 5 marks (Internal). Contact District Industrial Centre. (DIC for visits).

Text Book : Industrial Chemistry including Chemical Engineering - B.K.Sharma – Goel Publishing House. 13th Revised and Enlarged Edition

PART IV - SEMESTER II

NON MAJOR ELECTIVE

DRUGS AND COSMETICS

Credit 2
Hours . 2
Total Marks: 100
Internal: 25
External: 75

Unit – I

Importance of Drugs – Important terminologies, their meaning – Bacteria, virus, fungi, Names of drugs – Types of Bacteria

Unit – II

Antibiotics: Definition - uses of Antibiotics. 1. Ampicillin, streptomycin, tetracycline, rifomycin, Erythromycin, drug actions and side effects.

Unit – III

Vitamins: Classifications Role of vitamins in body's health – Uses of Vitamins – Antipyretics, Analgies and anti-inflammatory agents sulphonamide – Drug actions – uses of sulpha drugs.

Unit – IV

Preparation of Washing Powder, Cleaning Powder, White, Black, Yellow, Rose coloured phenoyls.

Unit – V

Preparation of shampoo, liquid blue, preparation of blue, green and red inks, soap oil, face powder and pain balm.

Preparation of cosmetics to be demonstrated

1. Washing and Cleaning Powder
2. Phenoyls
3. Inks
4. Shampoo

Visit to a Industry and submission of Report. For industrial visit / Assignment = 5 marks . (Internal). Contact District Industrial Centre. (DIC for visits).

Text Book : 1. Industrial Chemistry including Chemical Engineering - B.K.Sharma – Goel Publishing House. 13th Revised and Enlarged Edition

2. Albert Burger - Medicinal Chemistry
3. G.R.Chatwal -Medicinal Chemistry
4. Mrs. Lakshmi - Pharmaceutical Chemistry
5. ISI Manuals (Contact District Industries Centre)
6. Organic Chemistry by P.L. Sony.

III SEMESTER SCH8C31

Core Subject Paper –3

Physical chemistry – I

Credit – 4
Hours- 4
Max : 100 Marks
Ext : 75
Int : 25

Unit – I Gaseous state:

a. Postulates of kinetic theory gases – Derivation of ideal gas laws from the expression on the basis of kinetic theory of gases – Deviations – Vander Wall's equation- reduced equation of state – law of corresponding states compressibility factor for gases – Boyle and inversion temperatures of gases.

b. Maxwell – Boltzmann law of distribution of velocities (Derivation not necessary) graphical representation – effect of temperature on various velocities – experimental verification of Maxwell's law

C. Mean free path – viscosity of gases – collision number – Brownian movement and determination of Avogadro number – Loschmidt number – principle of equipartition of energy.

Unit – II

Liquid State :

Nature of cohesive forces in liquids – Trouton's rule and its significance.

Physical properties and chemical constitution

Molar volume and its application.

Surface tension – influence of temperature on surface tension – Parachor – atomic and structural Parachors – applications.

Viscosity – influence of temperature on viscosity – relation to chemical constitution - molecular viscosity – atomic and structural viscosity – Rheochor.

Refraction – refractive index – specific refractive index – molar, atomic and structural refraction – applications – liquid crystal – their applications.

UNIT – III

a. Adsorption : Definition of various terms – adsorption of gases on solids – characteristics of adsorption of gases on solids – physical adsorption and chemisorptions – factors influencing adsorption – adsorption isotherm – BET theory (Elementary idea only) – applications of adsorption.

UNIT-IV

Catalysis : Definition – characteristics – theories of catalysis – promoters and poisons – enzyme catalysis – mechanism – Michaleis – Menten equation acid – base catalysis and autocatalysis – application of catalysis.

UNIT-V

CHEMICAL KINETICS

a. Introduction- rate of reaction – rate law and rate constant – order and molecualrity of a reaction. Rection of first and pseudo unimolecular reactions. Catalytic decomposition of hydrogen peroxide – Decomposition of dinitrogen pentoxide. Inversion of can sugar and hydrolysis of ester by acid.
b. Second, third and zero order reactions – examples – rate equation – half life period (no derivation required).
c. Influence of temperature on the rate of reaction – Arrhenius rate equation and its significance – measurement of parameters. Theory of reaction rates : Bimolecular collision theory – unimolecular reactions – Lindemann's hypothesis – Absolute Reaction Rate theory.
d. Influence of ionic strength on reaction rate – primary and secondary salt effect – kinetics of fast reactions – relaxation method.

Text Book : Text Book of Physical Chemistry by Puri and Shrma.

IV SEMESTER

Core Subject Paper –4

INORGANIC CHEMISTRY II

Credit - 4
Hours- 4
Max : 100 Marks
Ext : 75
Int : 25

Unit I

Metallurgy – occurrence of metals – minerals and ores – mineral wealth of India – refining of metals – zone refining – electrolytic refining – van Arkel – de Boer process – important ores and extraction of the following metals – titanium, thorium, molybdenum, cobalt and platinum – their important alloys and applications.

UNIT II

Preparation, properties and uses of some important compounds – titanium oxide, thorium oxide, ammonium molybdate – vanadium pentoxide, sodium cobalti nitrite, chloroplatinic acid.

UNIT III

General discussion of group IV elements – comparison between carbon and silicon – hydrides of silicon and silicates – structure. carbonyl chloride – lead monoxide – red lead – white lead.

General discussion of group V elements – active nitrogen – preparation and properties of hydrazine, hydrazoic acid and hydroxylamine – test for arsenic.

UNIT IV

COORDINATION COMPOUNDS

Introduction – Nomenclature – isomerism in complexes – geometrical and optical - Werner's theory –Sidgwick theory-EAN rule- Valence bond theory - low spin and high spin complexes – magnetic properties - Limitations of VB theory - Crystal field theory - Octahedral and square planar complexes - Color of coordination complexes - Modified CFT – ligand field theory. Metal carbonyls- bonding and structure of Fe,Co,Ni and Cr carbonyls.

Unit V

THE INNER TRANSITION ELEMENTS

a. The lanthanide series – Occurrence - Properties:- electronic configuration, oxidation states, ionic radii-lanthanide contraction-consequences-causes, color, magnetic properties, oxidation potential, basic character, solubility of compounds, double salts; complexes - Extraction of lanthanides from monazite sand.

b. The actinide series – Sources - Transuranic elements – Preparation - Electronic configuration – Properties - Oxidation states - Ionic radii – Color of ions - Comparison of actinides with lanthanides.

Text Book : Text book of Inorganic Chemistry by Puri and Sharma (2007 Edition)

V SEMESTER

Core Subject Paper –5

ORGANIC CHEMISTRY - II

Credit – 4
Hours - 4
Max : 100
Ext : 75
Int : 25

Unit I

Aromatic compounds - 1

a. Introduction- general characteristics of aromatic compounds. Aromaticity and Huckel's rule. Structure of benzene- M.O. model.

b. Mechanism of aromatic electrophilic substitution (Halogenation, nitration, sulphonation and Friedel-Crafts reactions.

c. Directive influence of substituents based on electronic effects.

d. Trisubstituted benzenes - steric hindrance and rules for trisubstitution in benzene.

e. Mechanism of aromatic nucleophilic substitution, unimolecular, bimolecular and benzyne mechanisms.

Unit II

AROMATIC HYDROCARBONS, HALOGEN, NITRO AND AMINO COMPOUNDS

a. Preparation, properties and uses of toluene xylene and mesitylene

b. Aromatic halogen compounds: preparation, properties and uses of bromobenzene and benzyl bromide- Reactivity of aryl halides, distinction between nuclear and side chain halogenated derivatives.

c. Aromatic nitro compounds: preparation and properties of nitrotoluenes.

d. Aromatic amino compounds: Preparation by reduction of nitro compounds and from chlorobenzene. Effect of substituents on the basic character of aromatic amines. Comparison between aliphatic and aromatic amines. Estimation of aniline. Preparation of sulphanilic acid, nitroanilines and phenylene diamines.

e. Preparation and synthetic applications of benzene diazonium chloride.

UNIT III

AROMATIC COMPOUNDS - 1

a. Aromatic aldehydes : Benzaldehyde – mechanism of cannizzaro, perkins, claisen, knoevenagal reaction and benzion condensation.

b. Preparation & properties of cinnamaldehyde & vanillin.

c. Phenolic ketones :- phloroacetophenone – preparation - Houben – Hosch synthesis

d. Phenols : Acidity of phenols – effect of substituents on the acidity of phenol mechanism of Kolbe's reaction.

UNIT IV

AROMATIC ACIDS -

a. Effect of substituents on acidic character.

b. Substituted acids : preparation, properties of salicylic acid and anthranilic acid.

c. Dicarboxylic acids : preparation, properties of phthalic acid, phenylacetic acid, mandelic acid, cinnamic acid & coumarin.

d. Aromatic sulphonic acids preparation, properties and uses of benzene sulphonic acid, saccharin, chloramine – T and dichloramine - T

UNIT V

a. Poly nuclear hydrocarbons and their derivatives :

i. Isolated systems : Preparation and properties of diphenyl, benzidine diphenic acid, diphenylmethane, triphenylmethane and stilbene

Condensed systems : Preparation properties, uses and structure of Naphthalene, Naphthylamines, Naphthols, Naphthaquinones, anthracene, anthraquinone, alizarin and phenanthrene

Text Book : Text book of Inorganic Chemistry by Puri and Sharma (2007 Edition)

V SEMESTER

Core Subject Paper –6

Physical chemistry–II

Credit – 4
Hours - 4
Max : 100 Marks
Ext : 75
Int : 25

Unit – I : Atomic Structure -

a. Particle and wave nature of electron de Broglie's theory – equation – Davison – Germer experiment – photoelectric effect – Compton effect – Heisenberg's uncertainty principle – The Schrodinger wave equation (Derivation not required).

b. (Postulates of quantum theory)– Eigen values and eigen function – significance of Ψ and Ψ^2 – quantum number – Zeemann effet

Dr. Bark

UNIT-II

SOLID STATE

a. Laws of crystallography – law of constancy of interfacial angle, law of symmetry, law of rational indices – Miller indices – symmetry elements in a crystal – calculations involving interplanar spacing in crystal systems.

b. X-ray diffraction – Bragg's equation – (experimental method of determination of interplanar spacing – X ray spectrophotometer – the Debye – Scherrer method.) All

c. Types of crystals – ionic, molecular, covalent, and metallic crystals.

a. Ionic crystals : Analysis of NaCl, KCl, CsCl – determination of Avogadro number.

b. Molecular crystals – Water and ammonia.

c. Covalent crystals – Diamond and graphite.

d. Metallic crystals – Metallic bond in metals.

e. Conductors, insulators and semiconductors – Frankel and Schottky defects.

Dr. G. Nila

Unit – III

PHASE RULE

a. Definitions of terms – Gibb's phase rule – one component system – water, carbon di oxide and sulphur – polymorphism – two component system – reduced phase rule – simple eutectic system – Pb-Ag system – KI-water system

b. Partially miscible liquid system – CST – completely immiscible liquid system.

c. Distribution law : Mathematical formulation – experimental verification – condition under which the law is obeyed

Unit – IV

GROUP THEORY

A. **Molecular symmetry elements** and symmetry operations – operations – products of symmetry operations – properties of a group – classes and sub groups – groups multiplication table – C_{2v}.

B. **Point groups** – classification of molecules into point groups – C_{2v}, C_{3v}, C_{2h}, D_{2h}, D_{3h}, D_{4h}, D_{6h}, T_d and O_h.

C. Vector and matrix algebra – symmetry operations and transformation matrices.

UNIT-V

SPECTROSCOPY

A. **Introduction** – electro magnetic radiation – different regions – absorption spectroscopy – molecular spectra – types of molecular spectra.

B. **Rotational spectra of diatomic molecules** – rigid rotator – selection rule – determination of moment of inertia and bond length – intensities of spectral lines ~~– effect of isotropic substitution~~.

C. **Vibrational spectra** – IR spectra of diatomic molecules – Hooke's law – simple harmonic oscillator force constant – selection rule – vibrational energy level diagram – anharmonic oscillator – applications - force constant determination. Modes of vibration in polyatomic molecules – vibrational spectra of H_2O and CO_2.

D. Rotational vibrational spectra of diatomic molecules.

E. **Raman spectra** – Raman effect – stokes and anti stokes lines – quantum theory of Raman effect – experimental study – comparison between IR and Raman spectra – applications of Raman spectra.

F. **Electronic spectra** – Franck – Condon principle.

G. **Nuclear magnetic resonance spectroscopy** – principle, instrumentation – interpretation of nmr spectra – spectra of ethanol.

H. **electron spin resonance spectroscopy** – principle – difference between nmr and esr – hyperfine structure in esr spectrum – selection rule. hydrogen atom esr spectrum.

Text Book : Text book of Physical Chemistry by Puri and Sharma (Latest Edition 2008)

Core Subject Paper –7

INORGANIC, ANALYTICAL AND APPLICATIONS OF COMPUTERS IN CHEMISTRY

Credit – 4
Hours-4
Max : 100 Marks
Ext : 75
Int : 25

Unit I

a. Acids and bases - Arrehenius concept - Lowry Bronsted concept:- conjugate acid–base pairs, relative strengths of acids and bases - Lux –Flood concept - limitations - Lewis concept - Levelling effect - Usanovich concept – hard and soft acids.

b. Non aqueous solvents : Classification of solvents - Chemical reaction in liquid ammonia - Precipitation reaction - Acid –base reactions in liquid ammonia – Protolysis – Ammonolysis.

Unit II

BIO INORGANIC CHEMISTRY

a. Metallo porphyrins – Porphyrins – Chlorophyll - Vitamin B_{12}.

b. Myoglobin and hemoglobin – Structure - Their role in biological systems -Hill constant, cooperativity effect, Bohr effect - Explanation for cooperativity effect in hemoglobin

c. Role of alkali and alkaline earth metal ions in biological systems - Role of Na^+ and K^+ ions-sodium pump - Role of Mg^{2+} and Ca^{2+} ions.

d. Biological functions and toxicity of elements - Cr, Cu, As and radioactive elements.

UNIT – III

a. Methods of obtaining the Precipitate – Condition – Choice of Precipitant - merits and demerits of Organic Precipitants – Types – Specific and selective precipitants Sequestering agents – theory of precipitation – Dendrites – Paneth – Fajans - Hahn law – Coprecipitation – post precipitation – precipitation from homogeneous solution.

b. Precision – Accuracy – Absolute and relative error – Classification of errors – Confidence Limit – Students Q–test – Rejection of experimental data - Sources and elimination of errors – Significant figures and computation.

UNIT – IV

Analysis of experimental results

Graphical method – Curve fitting – Method of least squares – Problems involving straight line graphs.

Instrumental methods of Analysis

Beer-Lamberts Law – Principles of Colorimetric Analysis – Visual Colorimeter – Standard Series method – Balancing method – Estimation of Ni^{2+}, Fe^{3+}.

Basic principles of common types of Chromatography – Column Chromatography – Thin layer Chromatography – Paper Chromatography – Ion exchange Chromatography Applications of each technique.

UNIT – V

Application of 'C' language in Chemistry – Introduction of 'C' language – Character set – 'C' tokens – Keywords and Identifiers – Constants, variables, Data types and operators – Computation of some simple problems in Chemistry such as 1) Half life period, 2) Normality, Molality and Molarity of a solution. 3) Root mean square velocity. 4) Ionic strength of an electrolyte, 5) Lambert's Beer's Law.

Text Book : Text book of Inorganic Chemistry by Puri and Sharma (Latest Edition 2008)

V Semester

ELECTIVE SUBJECTS

PHARMACEUTICAL AND MEDICINAL CHEMISTRY

Credit - 2

Hour- 2

Max : 100 Marks

Ext : 75

INT : 25

UNIT – I

a. Introduction to the different systems of medicine

Ayurveda. Siddha. Homeopathy and Allopathy – History of medicinal chemistry – Discovery of drugs-an introduction.

b. Analgesics and Antipyretics

Narcotic analgesics – Morphine and derivaties. Totally synthetic analgesics – pethidine and methadones.

Antipyretic analgesics – salicylic acid derivatives, indol derivatives and p1-amino phenol derivatives (Medicinal uses and structure only)

c. Diagnostic tests and estimation of sugar, urea and cholesterol in serum, urine etc., Detection of pesticides and poisons – Antidotes for poisoning – First aid for poison by pesticides.

UNIT – II

Chemotherapy and application of a few drugs (Elementary study)

(i) Sulpha drugs – Sulphadiazine, prontosil and prontosil-S

(ii) Antimalarials – quinine, and its derivatives

(iii) Arsenical drugs – salvarasan – 606 – Neosalvarsan

(iv) Antibiotics: Definition, Penicillin – Tetracycline (Auromycin and Terramycin) – Streptomycin and Chloromyceitin – drug action and uses

UNIT - III

Hormones and Vitamins

(i) Definition and Classification, Testosterone, Progesterone, Thyroxine, Vitamin C, Structure only (Structural elucidation not necessary)

UNIT - IV

Anaesthetics

(i) Gaseous anaesthetics – Vinyl ether - Cyclopropane – Halohydrocarbons – Chloroform – Haloethane – Trichloro ethylene – Intravenous anaesthetics – Thiopentone –Local anaesthetics – Cocaine and its derivatives.

Note : Therapeutic use only .

Unit – V

Synthetic drugs and its therapeutic function of paracetamol – Aspirin – naproxen – amoxyllin –ciprofloxacin – Ibuprofen.

Visit to a Industry and submission of Report. For industrial visit / Assignment = 5 marks (Internal). Contact District Industrial Centre. (DIC for visits).

Reference :

1. Industrial Chemistry including Chemical Engineering - B.K.Sharma – Goel Publishing House. 13th Revised and Enlarged Edition
2. Grodman and Gilman's "The Pharmacological basis of therapeutics"
3. Pharmacology, Mary J. Mycek and Richard a. Harvey 2nd Edition 2000.
4. Foy's Principles of Medicinal Chemistry, David A. Williams and Thomas L. Lemke Edn, V, 2002.
5. Hand book of experimental Pharmacology S.K. Kulkarni, 3rd Edn 1999.
6. A textbook of Pharmaceutical Chemistry Jayashree Ghosh S. Chand & Company Ltd 1997.
7. Pharmaceutical Chemistry Dr. S. Lakshmi Sultan Chand &sons 2004.
8. Industrical Chemistry, B.K. Sharma Goel Publishing house, Edn XIII, 2008.
9. Pharmaceutical Manufacturing encyclopedia, Vol I and II 2nd Edn 2000.
10. Unit Process in organic synthesis, Grogging 5th Edn, 2000.
11. Biopharmaceutics and Pharmokinetics D.M. Brahamanikav and Sunil, B. Jaiswal, Edn XIX, 2004.

Text Book : Text book of Phrama Chemistry by Jayashree Ghosh. S. Chand Company (Latest Edition 2008).

SEMESTER VI

Core Subject Paper 8

ORGANIC CHEMISTRY - III

Credit : 4
Hours : 4
Max : 100 Marks
Ext : 75 Int : 25

UNIT I

- Molecular rearrangements : Detailed mechanisms of the following : pinacol - pinacolone, Hofmann, curtius, Schmidt benzylic acid, claisen, benzidine, Beckmann, Favorskii and Wagner-Meerwein rearrangements.
- Free radicals : Definition – preparation and reactions of short lived and long lived free radicals – stability of free radicals - detection of free radicals – chain reactions - photochemical reactions of olefins, cis-trans isomerisation. Mechanism of Sand Meyer reaction, Gomberg reaction and Hofmann – Loeffler reaction.

UNIT II

- PRINCIPLES AND APPLICATIONS OF SPECTROSCOPY:

UV – Introduction – Type of electronic transition – absorption laws – bathochromic shift and hypsochromic shift – hyperchromic and hypochromic effect – applications of UV to organic compounds – Woodward Fieser rule – calculation of λ_{max}.

IR – Introduction – Instrumentation – Mode of vibration – overtone and combination bands – applications of IR to organic compounds – finger print region – effect of hydrogen bond.

NMR – Introduction – chemical shift – shielding and deshielding effects – factors influencing chemical shift – solvent used – splitting of signals – coupling constants – NMR spectra of ethanol and anisole.

Simple problems involving the application of UV, IR and PMR spectroscopy

UNIT-III

Heterocyclic compounds:preparation and properties of pyrrole pyridine quinoline and isoquinine.

Alkaloids : Definition - occurrence and extraction of alkaloids – general methods for determining the structure of alkaloids – classification of alkaloids – structure and synthesis of following alkaloids – coniine, piperine, nicotine and papavarine.

UNIT IV

d. Alicyclic compounds :General methods of preparation and properties of cycloparaffines - Baeyer's strain theory and its modification

e. Conformational Analysis : Difference between configuration and conformation. Fischer, Saw – horse and Newman projection formulae – Conformational analysis of ethane, n-butane, 1,2- dichloroethane, cyclohexane and monosubstituted cyclohexane.

f. Civetone and Muscone any one method of synthesis - Structure only (no Structural elucidation)

UNIT-V

a. Terpenes :

i. Introduction, classification, occurrence and isolation – general properties – isoprene rule – general methods of determining structure – synthesis. Properties and structure of citral, geranial, terpeniol, menthol and camphor.

b. Proteins and Nucleic acids :

i. Definition – classification of proteins – colour reactions of proteins – primary, secondary, tertiary and quarternary structure of proteins (an elementary idea only)

ii. Nucleic acids – nucleosides – nucleotides – RNA and DNA general structure.

Text Book : Text book of Organic Chemistry by P.L. Soni. (Latest Edition 2008).

CORE PAPER -9

PHYSICAL CHEMISTRY III

Credit -4
Hours - 4
Max : 100 Marks
Ext : 75
Int : 25

Unit I

Thermodynamics I

First Law; statement – mathematical formulation – internal energy – enthalpy or heat content – heat changes at constant volume and at constant pressure conditions – relationship between C_P and C_V – work done, heat change and enthalpy change for reversible isothermal expansion and compression of an ideal gas – calculation of q, w, ΔE, ΔH for reversible adiabatic expansion of an ideal gas – relation between T, V and P of an ideal gas undergoing adiabatic reversible expansion comparison of work done in isothermal and adiabatic reversible expansion of an ideal gas – application of I law to non ideal gas undergoing reversible isothermal and adiabatic expansion – Joule effect – Joule Thomson effect – Joule Thomson coefficient in the case of ideal and real gases – inversion temperature – Hess' law of heat summation – Kirchoff's equation – Bond enthalpies.

Unit II

SECOND LAW OF THERMODYNAMICS

1. Limitations of I law of thermodynamics – spontaneous process – statement of II law – conversion of heat into work - thermodynamic efficiency – Carnot cycle – refrigeration cycle – Carnot theorem – Kelvin scale of temperature.
2. **Entropy** – definition and significance – derivation of the concept of entropy – entropy changes in reversible and irreversible (spontaneous) processes. Entropy as a thermodynamic function – dependence of entropy on the variables of the system for ideal gases – entropy of mixing of gases – ΔS for physical transformation in chemical reactions – entropy and probability.