



ARULMIGU PALANIANDAVAR ARTS COLLEGE FOR WOMEN

(Autonomous)

(Re-Accredited with 'A' Grade by NAAC)

(A Government Aided College- Affiliated to Mother Teresa Women's University,

Kodaikanal)

CHINNAKALAYAMPUTHUR (PO), PALANI-624615.

DEPARTMENT OF CHEMISTRY



SYLLABUS

2016-2019

COMMON ACADEMIC STRUCTURE IN AUTONOMY

CBCS

Effect from the academic year 2016-17 and onwards

| Semester | Hour | Subject | Internal | External | Total | Credit |
|-----------|-----------|--|----------|----------|------------|-----------|
| I | 6 | Part I Tamil | 25 | 75 | 100 | 3 |
| | 6 | Part II English | 25 | 75 | 100 | 3 |
| | 4 | Part III Core Paper–I General Chemistry – I | 25 | 75 | 100 | 4 |
| | 4 | Core paper–II Organic Chemistry-I | 25 | 75 | 100 | 4 |
| | 2 | Core Practical | ---- | -- | -- | -- |
| | 5 | Allied I-Mathematics Theory Paper I | 25 | 75 | 100 | 5 |
| | 2 | Part IV SBC–Environmental Sanitation Science | 25 | 75 | 100 | 2 |
| | 1 | Value Education–Yoga and Meditation –Theory | --- | -- | -- | ---- |
| | 30 | Total | | | 600 | 21 |
| II | 6 | Part I Tamil | 25 | 75 | 100 | 3 |
| | 6 | Part II English | 25 | 75 | 100 | 3 |
| | 7 | Part III Core Paper–III General Chemistry – II | 25 | 75 | 100 | 4 |
| | 3 | Core Practical | 40 | 60 | 100 | 4 |
| | 5 | Allied Paper II Mathematics | 25 | 75 | 100 | 5 |
| | 2 | Part IV SBC–Dairy Chemistry | 25 | 75 | 100 | 2 |

| | | | | | | |
|------------|-----------|--|----|----|------------|-----------|
| | 1 | Value Education–Yoga & Meditation –Practicals | 25 | 75 | 100 | 2 |
| | 30 | Total | | | 700 | 23 |
| III | 6 | Part I Tamil | 25 | 75 | 100 | 3 |
| | 6 | Part II English | 25 | 75 | 100 | 3 |
| | 6 | Part III: Core Paper–IV Concise Chemistry | 25 | 75 | 100 | 4 |
| | 3 | Core Practical | -- | -- | -- | -- |
| | 3 | Allied II-Physics | 25 | 75 | 100 | 3 |
| | 2 | Allied Practical | -- | -- | -- | -- |
| | 2 | Part IV: SBC-Polymer Chemistry | 25 | 75 | 100 | 2 |
| | 2 | NME-Health Chemistry | 25 | 75 | 100 | 2 |
| | 30 | Total | | | 600 | 17 |
| IV | 6 | Part I Tamil | 25 | 75 | 100 | 3 |
| | 6 | Part II English | 25 | 75 | 100 | 3 |
| | 4 | Core paper V Organic Chemistry-II | 25 | 75 | 100 | 5 |
| | 4 | Core paper VI Physical Chemistry- I | 25 | 75 | 100 | 4 |
| | 3 | Core Practical II | 40 | 60 | 100 | 4 |
| | 3 | Allied II-Physics | 25 | 75 | 100 | 3 |
| | 2 | Allied Practical | 40 | 60 | 100 | 4 |
| | 2 | Part IV SBC-Forensic Science | 25 | 75 | 100 | 2 |
| | - | Part V Extension activities | - | - | - | 1 |
| | 30 | Total | | | 800 | 29 |

| | | | | | | |
|-----------|-----------|--|----|----|------------|-----------|
| V | 6 | Part-III Core paper–VII Organic chemistry-iii | 25 | 75 | 100 | 5 |
| | 6 | Core paper–VIII Inorganic chemistry-ii | 25 | 75 | 100 | 4 |
| | 6 | Practical III | -- | -- | -- | -- |
| | 5 | Elective I Analytical and elements of organic spectroscopy | 25 | 75 | 100 | 5 |
| | 5 | Elective II Pharmaceutical chemistry | 25 | 75 | 100 | 5 |
| | 2 | Part-IV -pulp and paper technology | 75 | 25 | 100 | 2 |
| | 30 | Total | | | 500 | 21 |
| VI | 6 | Part-III Core paper–IX Organic chemistry-iv | 25 | 75 | 100 | 5 |
| | 7 | Core paper–X Physical chemistry-ii | 25 | 75 | 100 | 5 |
| | | Practical-III | 40 | 60 | 100 | 4 |
| | 6 | Practical-IV | 40 | 60 | 100 | 4 |
| | 5 | Elective-III Industrial chemistry | 25 | 75 | 100 | 5 |
| | 2 | Part-IV-EVS | 25 | 75 | 100 | 2 |
| | 2 | Project | 25 | 75 | 100 | 2 |
| | 2 | NME-food chemistry | 25 | 75 | 100 | 2 |
| | 30 | Total | | | 800 | 29 |

TOTAL-MARKS: 4000

TOTAL CREDITS:140

QUESTIONPAPER PATTERN

(ForBA/B.Sc./B.Com./B.CA/B.Com.C.A)

FOR CORE, ALLIED & ELECTIVE PAPERS

SUMMATIVE EXAMINATION

Duration-3 Hrs

Total Marks - 75Marks

Section A-----10X1=10 -----No choice

Section B-----5X3=15----- 5 out of 7 questions

Section C-----4X5=20-----4 out of 6 questions

Section D-----3 X10=30 ----- 3 out of 5questions

INTERNAL MARKS:

THEORY - 15

ASSIGNMENT - 5

SEMINAR - 5

TOTAL - 25

INTERNAL QUESTION PAPER PATTERN:

Duration-1 Hr

Total Marks -25Marks

| | | |
|-----------------|--------|----------------------|
| Section A ----- | 1X 3=3 | No choice |
| Section B----- | 2X1=2 | 1 out of 2 questions |
| Section C----- | 4X1=4 | 1 out of 2 questions |
| Section D----- | 6X1=6 | 1 out of 2 questions |

SEMESTER-I
CORE-I - GENERAL CHEMISTRY-I

Objectives

1. To study the adsorption, classification of adsorption and factors affecting adsorption catalysis, theories of catalysis and its application
2. To know the rate of chemical reaction, factors influencing reaction rates, rate law, rate constant, order and molecularity of the reaction, classification of rates based on the order of the reaction, rate equation for first order reactions, half life period, simple and complex reactions and types of complex reactions
3. To know the basics of electrochemistry, definition of various terms, theory of electrolytic conductors, Ostwald's dilution law for weak electrolytes-Faraday's laws of electrolysis, variation of equivalent conductance with concentration, Kohlrausch's Law, common ion effect, buffer solutions, Henderson equation, pH indicators.

UNIT- I: ATOMIC STRUCTURE AND PERIODICITY

Atomic orbital-Quantum numbers –Principal, azimuthal, magnetic and spin quantum numbers and their significance-shapes of atomic orbital-g and u character of atomic orbital-nodal points and nodal planes-Principles governing the occupancy of electrons in various quantum levels-Pauli's exclusion principle- Hund's rule of maximum multiplicity-Aufbau principle,(n+1) rule-writing practice for electronic configuration of vital elements in s,p,d & f block elements-stability of half and fully filled orbital with suitable examples.

Long form of the periodic table-characteristics-classification of elements on the basis of electronic configuration-periodicity of properties-cause of periodicity-explanation of atomic radii, ionic radii, electron affinity, ionisation energy, electronegativity -factors affecting their magnitudes.

UNIT- II: CHEMICAL BONDING

(a)Types of chemical bonds – ionic, covalent, co-ordinate covalent, hydrogen (inter and intra)and metallic bonds with few suitable examples-comparison between them .

(b) Chemical Bonding – valence bond approach-VB theory- types of overlapping and orbital diagrams- sigma and pi bonds-concept of hybridisation and geometry of molecules- sp , sp^2 , sp^3 , sp^3d and sp^3d^2 with suitable examples.VSEPR theory-shapes of some simple inorganic molecules- $BeCl_2$, $SiCl_4$, PCl_5 , SF_6 , IF_7 , NH_3 , XeF_6 and H_2O .

(C)Molecular Orbital Theory-bonding and anti bonding molecular orbital-relative order of energies of molecular orbital-MO theory applied to Homolo nuclear molecules- Hydrogen, Helium, Nitrogen, Oxygen-Hetero nuclear molecules-HF and CO-comparison of VB and MO theories.

UNIT-III: SURFACE CHEMISTRY:

(a) **Adsorption**- classification of adsorption of gases on solids- types of adsorption – differences between them – factors affecting adsorption.

(b) **Catalysis**- general characteristics- types of catalytic reactions-types of catalysts- promoters- catalytic poison – theories of catalysis-application of catalysis

UNIT– IV : CHEMICAL KINETICS:

Scope of chemical kinetics- rate of chemical reaction – factors influencing reaction rates- rate law- rate constant – order and molecularity of the reaction – differences between them- classification of rates based on the order of the reaction- rate equation for first order reactions – examples – half life period with derivation – rate equation for pseudo-first order reaction- simple and complex reactions-differences between them – types of complex reactions

UNIT-V: ELECTRO CHEMISTRY-I:

Conductors, insulators and semi conductors-definition with examples-theory of electrolytic conductors- Ostwald's dilution law for weak electrolytes-Faraday's laws of electrolysis- conductance- specific resistance- specific conductance-equivalent conductance- molar conductance-variation of equivalent conductance with concentration- Kohlrauch's Law- statement and application(anyone)- common ion effect-buffer solutions-Henderson equation-pH indicators-selection of pH indicators.

Text books:

1. A Text book of inorganic chemistry by – Puri , Sharma, kalia and Kaushal.
2. A Text book of inorganic chemistry by- P.L.Soni.
3. A Text Book of Physical Chemistry – Puri ,Shama and Pathania

References Books:

1. Modern Inorganic Chemistry by R.D. Madan,
S. Chand & Company LTD, Ram Nagar, New Delhi, Edition 2007.
2. Essentials of Physical chemistry by Arun Bahl and B.S. Bahl, G.D.Tuli
S. Chand & Company Ltd, Edition 2006.

CORE PAPER- II
ORGANIC CHEMISTRY-I

Credits: 4

Max Marks: 75(Ext); 25(Int)

- i) To Know the Fundamental Concepts of Organic Chemistry and its Reactions.**
- ii) To study the reactions mechanisms and properties of Aliphatic hydrocarbons like alkanes, alkenes, and alkynes.**

UNIT-I - FUNDAMENTAL CONCEPTS-I

- a) **Introduction to Organic Chemistry** –Sources and classification of Organic compounds.
- b) **Nomenclature of Organic compounds** –Functional groups : Definition – various functional groups – common and IUPAC system of naming- Aliphatic and Aromatic hydrocarbons up to 10 carbon atom systems and other functional derivatives.
- c) **Detection and estimation of elements:** Lassaigne's test and Beilstein test- Estimation of nitrogen by Kjeldahl's method -Halogens and Sulphur by Carius method.
- d) **Purification techniques:** Fractional distillation, sublimation and crystallization.
- e) **Determination of Molecular weight of Organic acids and bases**-Silver salt method for acids, Platinic chloride method for bases. Problems in determining empirical and molecular formulae - differences between them.

UNIT-II-FUNDAMENTAL CONCEPTS-I

- a) **Introduction to Organic Chemistry** –Sources and classification of Organic compounds.
- b) **Nomenclature of Organic compounds** –Functional groups : Definition – various functional groups – common and IUPAC system of naming- Aliphatic and Aromatic hydrocarbons up to 10 carbon atom systems and other functional derivatives.
- c) **Detection and estimation of elements:** Lassaigne's test and Beilstein test- Estimation of nitrogen by Kjeldahl's method -Halogens and Sulphur by Carius method.
- d) **Purification techniques:** Fractional distillation, sublimation and crystallization.
- e) **Determination of Molecular weight of Organic acids and bases**-Silver salt method for acids, Platinic chloride method for bases. Problems in determining empirical and molecular formulae differences between them.

UNIT-III-FUNDAMENTAL CONCEPTS-II

- a) Tetrahedral arrangement of valencies of carbon atoms.
- b) Cleavage of bond: Homolytic and Heterolytic Cleavages of Carbon bond.
- c) Electrophillic and Nucleophillic reagents-Definition and examples.
- d) Electronic effects: Inductive, Electromeric, Resonance effects and hyper conjugation.
- e) Reaction intermediates: Free radicals, Carbonium ion, (carbocation) Carbanions and Carbenes - generation and their stability.

UNIT-IV-ALIPHATIC HYDROCARBONS-I

- a) Alkanes: Introduction- Sources- Preparation by wurtz synthesis, decarboxylation and using Grignard reagents- reactions- halogenations-free radical mechanism of halogenations of alkanes- Cracking and Pyrolysis – Octane number- flash point- synthetic petrol, natural gas.
- b) **Alkenes:** Introduction- classification of alkenes, Preparation by dehydro halogenation of Rx- dehydration of alcohols & by heating quaternary ammonium salts- Hoffmann's rule and Saytzeff rule with examples. Reactions of alkenes- Electrophillic addition of Br₂ and HBr- Markownikoff's rule with examples- Peroxide effect with examples.

UNIT-V-ALIPHATIC HYDROCARBONS-II

- a) **Dienes:** Classification-isolated-cumulated and conjugated double bond systems-Diels- Alder reactions-1,2 and 1,4- addition mechanism in butadiene- Geometrical isomerism of dienes.
- b) **Alkynes:** Introduction-preparation of alkynes-acidity of alkynes-Chemical properties- substitution, Hydrogenation, Ozonolysis and combustion reactions of alkynes(Mechanism not necessary)
- d) **Isomerism**-Structural,chain,position,functionalisomerism-Tautomerism and Metamerism- Explanation with examples.

Types of Organic Reactions:

- a) Detailed mechanism of aliphatic nucleophillic substitution reactions-SN¹, SN², SNⁱ reactions.
- b) Detailed mechanism of aliphatic elimination reactions: E¹, E², E_{1CB} reactions-substitution Vs elimination – polymerization reaction - types- explanation with suitable illustrations.
- c) Rearrangement reactions involving alkanes, alkenes and alkynes.

Reference Books:

1. A text book of Organic Chemistry by B.S. Bahl and Arun Bahl.
S. Chand & Company LTD, Ram Nagar, New Delhi. 20th Revised Edition-2011
2. A Text Book of Organic Chemistry by P.L. Soni.
3. A Text Book of Organic Chemistry by M.K Jain & S.C. Sharma.

CORE PRACTICAL – I
SEMI MICRO QUALITATIVE ANALYSIS

Hrs: 3

Credits: 4

Max Marks: 75(Ext); 25(Int)

Objectives:

To Analyse the given inorganic mixture containing two anions (one interfering and one simple anion) and two of the following cations Pb, Cu, Bi, Fe, Ni, Co, Zn, Mn, Ba, Sr, Ca, Mg and NH_4^+

Cations

Lead, copper, cadmium, bismuth, iron, aluminium, Zinc, manganese, cobalt, nickel, barium, strontium, calcium, magnesium and ammonium.

Anions

Carbonate, sulphate, nitrate, chloride, oxalate, borate, phosphate, chromate and fluoride.

Text Books:

1. Vogel - A Text Book of qualitative inorganic Analysis.

Reference Books:

1. Basic Principles of Practical Chemistry By
V.Venkateswaran , R. Veeraswamy &
A.R.Kulandaivelu

Part –IV-Environmental Sanitation

Unit – 1:

(a) Definition and scope of environmental Sanitation.

(b) Rural Water Supply:

Water & health – sources of water and their characteristics (Rain water- surface water, ground water) – Diseases transmitted through water and channels of transmission of infection – protected water supply- Estimating the quantity of water required by a community wells as a source of water supply for rural areas – selection of site for a well – classification of wells – renovation of citing of wells- study of various type of hand pumps – infiltration gallery – Pond water supply- Disinfection of water supplied – water quality collection of water samples.

Unit – II

(a) Urban water supply:

(b) Components of urban water supply system – difference between a pumped system and a gravity system- different types of treatment (Aeration, Sedimentation rapid & slow filters, Disinfection, PH adjustment , etc) Fluoridation and defluoridation – Domestic treatment of water – duties of sanitary Inspector in relation to water supplies – Desalination.

(c) (b) Excreta disposal:

(d) Public Health aspects of excreta disposal – requirements of a sanitary latrine- Selection of site for latrine- public & Latrines and their constructional features – Control of pollution from latrine pits- organization of Latrine programme in rural and Urban area – Low cost sanitation programmes.

Unit – III

(a)Refuse collection and disposal:

Definitions – Collection and disposal of rubbish various methods – (dumping composting incineration, sanitary land fill) waste recycling – planning for refuse collection and disposal.

(c) Disposal of dead:

Need for proper disposal – various methods burning , burial and committal to sea (or) river, silent tower, electric cremation- public health aspects – emergency disposal during.

Unit – IV

(a) Waste water disposal:

Public health importance and methods of disposal of waste water – what are liquid waste – situations that a health inspector will come across in waste water disposal , different methods- soak pits, seepage pit – dispersion trench kitchen garden drawing etc.

Unit – V

(a) Drains:

Construction- different type of drain – methods disposal of drained water, sewage: object of sewage – definition of terms of sewers , bod , cod- sewer appurtenances- sewer maintenance and preacustion to be taken by cleaning crewsewage treatment primary, secondary etc. Oxidation pond, sewage farm- trickling filter – imhoff tank.

(b) Plumbing:

Various fixtures used in plumbing – scope of plumbing – water system waste system –cross connection in plumbing – tools and materials used in plumbing.

Reference Books :

1. Environmental Sanitation by Joseph.A. Salvato.
2. Environmental Sanitation by K.V.S.G.Murali Krishna.

| | | | |
|--------------------|-------------|-------------------------------|---------------------------|
| Course Code | PUVE | Title: Part – IV - VBE | Batch: 2016 - 2019 |
| Hours/week | 1 | Value Education | Semester: I |
| | | | Credits: 3 |

நோக்கம்:

1. மாணவியர்களிடையே நற்பண்புகளையும் நல்லொழுக்கத்தையும் வளர்த்தல்
2. தலைமைப்பண்பு மற்றும் ஆளுமைத்திறனை மேம்படுத்த ஊக்குவித்தல்
3. மத நல்லிணக்கத்தையும் மற்றும் சமூக உறவுகளையும் மேம்படுத்துதல்.

தொகுதி: 1

மதிப்பும் தனிமனித மேம்பாடும் :- மதிப்புக்கல்வி- முக்கியத்துவம்- தனிமனித மேம்பாட்டில் மதிப்புக்கல்வியில் பங்கு- அறம்- மன்னிப்பு- அமைதி- புன்முறுவல்- மரியாதை- உண்மை-தேரீயம்- ஆளுமைத்திறன் நட்பு- சமூகச்சீர்கேடுகளைக் களைதல்- கவலை- ஆசை- சினம்- ஏற்றத்தாழ்வுகள்- தற்கொலை- போதைப்பழக்கம்.

தொகுதி :2

மதிப்பும் சமயங்களும்: இந்துமதம்- கிறித்துவசமயம் - இஸ்லாமிய சமயம்- புத்த சமயம்- சமண சமயம்- சீக்கிய சமயம்- ஜோராஜ்ஜிரிய சமயம்- சமய நல்லிணக்கம்.

தொகுதி :3

பணி சார்ந்த மதிப்புகள் : பணிப்பண்பு- உழைப்பு- நேர்மை- பொறுப்பு-கற்றுத் தேர்தலில் ஆர்வம்- நேரம் தவறாமை- அர்ப்பணிப்பு- முயற்சி- வெளிப்படை- மனநிறைவு- குழு ஆற்றல்.

தொகுதி : 4

மதிப்புகளை உருவாக்கும் அமைப்புகள் : குடும்பம்- உறவுகள்- தனிமனிதனும் சமுதாயமும்- மதிப்பும் கல்வி நிறுவனங்களும்- முன் மாதிரிகள்.

தொகுதி : 5

மதிப்பும் ஊடகங்களும் : செய்தித்தாள்கள்- சஞ்சிகைகள்- வானொலி- தொலைக்காட்சி- திரைப்படம்- இணையதளம்- கைபேசி.

Reference Books :

1. Agarwal .V.K consumer Protection in India, Deep and publication, New Delhi. 1999.
2. Ram Ahuja, Social problems in India, Rawat publication, New Delhi. 1992
3. David L.Loundan and Albert J.Della Bitta, consumer Behaviour, M.C. Grawhill Book co. Singapour, 1993
4. Saravanan. P. Value Education, Merit India publications Madurai. 2011.
5. Chandra Mowli, B.R. Ambedkar –Man and his vision, Sterling publication PVT .Ltd . New Delhi. 1990
6. Varma.R.S. Human Rights – Buring issues of the world, Vol ;I, Indian publishers Distribution, New Delhi. 2000

Text Book :

1. தி.செல்வநாயகி & வெ.மீனாக்குமாரி, வெற்றியை நோக்கி, NCBH, Chennai, 2013
2. முருகன் A.பொன்முருகன், ரோஸ்கேத்தரின், சீரமீகு சமுகக்கல்வி, சாதனா பப்ளிகேஷன்ஸ், நாகர்கோயில் 2003.

SEMESTER-II
COREPAPER-III-GENERAL CHEMISTRY -II

Hrs:4/Hrs

Credits:4

Max Marks: 75(Ext); 25(Int)

UNIT- I: STRUCTURE OF SOLIDS

(a) Lattice Energy- ionic crystals, NaCl and CsCl crystal structure – determination of lattice energy using Born-Haber cycle-factors affecting crystal lattice energy-properties of ionic crystals(higher melting point, hardness, electrical conductivity in molten condition and in solution)-Polarisation and Polarising ability- Fajans Rule-Vander Waals forces-ion-ion, ion-dipole interactions.

(b) Modern Concepts of Acids & Bases :

Acids and Bases : Modern concepts of acids and bases-Arrhenius, Lowry-Bronsted – Acidity & Basicity, relative order of acidity & basicity-Lux-Flood concept-Lewis concept- Usanovich concept-Levelling effect.

UNIT-II

(a) **Metallurgy** : Occurrence of metals –minerals and ores-mineral wealth in India-steps involved in metallurgical process-concentration-calcination-roasting-reduction to free metal- electrometallurgy-hydrometallurgy-refining of metals-electrolytic refining-Van Arkel process.

(c) Organic & inorganic reagents in semi-micro qualitative analysis – spot tests-advantages-disadvantages- DMG- aluminon & Magneson reagent-thiourea.

UNIT-III :SOLID STATE

(a) Isotropy and anisotropy-symmetry in crystal systems-point groups space lattice unit cell- Bravais lattice-seven crystal systems-laws of crystallography-law of constancy of interfacial angle-law of symmetry-law of rational indices-miller indices-symmetry elements in crystal systems-X-Ray diffraction-Bragg's equation-experimental method of determination of interplanar spacing-calculations involving interplanar spacing in crystal systems.

(b) Types of crystals—ionic, molecular, covalent and metallic crystals.

1. Ionic Crystals: Analysis of KCl-Fajan's rule of polarisation of ions.
2. Molecular crystals – Water and Ammonia.
3. Covalent crystals – Diamond and Graphite.
4. Metallic crystals: Metallic bond in metals
5. Conductors, insulators and semiconductors-Frankel and Schottky defects.

UNIT – IV: KINETIC THEORY OF GASES

- (a) Postulates of kinetic theory of gases-** Derivation of ideal gas laws from the expressions on the basis of kinetic theory of gases-deviation-Vander waals equation- Equation of state-Clausius, Berthelot and Dieterici equations of state-Reduced equation of state law of corresponding states-expansivity and compressibility factor for gases- Boyle and inversion temperatures of gases.
- (b) P-V isotherms of ideal and real gases-**Andrew's experiments-critical state of gases- definition and determination of critical constants-relation between critical and Vander waals constants.
- (c) Maxwell-Boltzmann law of distribution of velocities**(Derivation not necessary)- graphical representation-effect of temperature on various velocities-comparison of RMS, average and most probable velocities.
- (d) Mean free path-viscosity of gases-**collision diameter, frequency and cross section - Loschmidt number-principle of equipartition of energy.

UNIT-V :

(i) NUCLEAR CHEMISTRY-I :

- (a) Constitution of the nuclei** – stable and unstable nuclei-their relationship to a n/p ratio-magic number-mass defect and binding energy-whole number rule-packing fraction-mass energy relationship.
- (b) Natural Radioactivity-**Detection and measurement of radioactivity-Soddy's group displacement law.
- (c) Artificial Radioactivity :** Definition- different types of artificial radioactivity brought about by accelerated particles.
- (d) Artificial transmutation of atoms by projectiles-spallation.**

(ii) NUCLEARCHEMISTRY-II :

- (a) Nuclear fusion and fission-Theories of fission-application of fission- principles of atom bomb-nuclear fusion-emission of energy-stellar energy and hydrogen bomb.
- (b) Application of Radioactivity : Application in medicine-in agriculture- industry-as trace elements in the elucidation of structure and in the investigation of reaction mechanism in analytical chemistry-activation analysis- carbon dating.
- (c) Particle accelerator-Linear accelerator–cyclotron and synchrotron
- (d) Nuclear Reactors : Nuclear reactor –nuclear fuel- FBR- moderators- coolants- Applications.

TEXT BOOKS:

1. A Text Book of Physical Chemistry – P.L Soni.
2. A Text Book of Physical Chemistry – Puri & Sharma
3. A Text Book of Inorganic Chemistry – R.D. Madhan
4. A Text Book of Inorganic Chemistry – P.L Soni.

REFERENCE BOOKS:

1. Modern Inorganic Chemistry by R.D. Madhan,,S. Chand & Company LTD,
Ram Nagar, New
Delhi, Edition 2007.
2. Essentials of Physical Chemistry by B.S. Bahl and Arun Bahl G. D.Tuli S.
Chand & Company
Ltd, Edition 2006.

SKILL BASED COURSE

DAIRY CHEMISTRY

Hrs: 2 Per Week

Credits: 2

Max Marks: 75(Ext); 25(Int)

Unit I: Milk

General composition of milk - factors affecting the gross composition of milk, physico-chemical change taking place in milk due to processing parameters - boiling pasteurization - sterilization and homogenization.

Unit II Milk lipids – terminology and definitions.

Milk proteins : Physical properties of milk proteins with formaldehyde and ninhydrin.

Milk carbohydrate – Lactose. Estimation of lactose in milk.

Milk vitamins – water soluble vitamins.

Unit III a.Creams: Definition – composition – chemistry of creaming process.

b.Butter : Definition - % composition – manufacture. Estimation of fat acidity, salt and moisture content Desi butter.

UNIT IV a.Milk powder : Definition need for making power – drying process spraying, drum drying, jet drying and foam drying – principle involved in each.

b.Ice cream: Definition percentage composition – types – ingredients needed manufacture of ice-cream stabilizers – emulsifiers and their role.

Unit V Dairy Detergents : Definition – characteristics- classification – washing procedure (modern method) sterilization – chloramines – T and hypochlorite solution.

TEXT BOOKS :

1. DAIRY CHEMISTRY BY HARRY SYNDER,PUBLISHED BY TRIESTE,17.05.2018

REFERENCE BOOKS:

1. Outlines of Dairy Technology Sukumar De .
2. Principles of Dairy Chemistry – Robert Jenness & S.Patton .
3. Indian Dairy products K.S.Rangappa and K.T Acharya .

SEMESTER-III CORE PAPER-4

CONCISE CHEMISTRY

| | |
|-----------------|---|
| Unit-I | <p>Introduction to crown ethers structure, Application of crown ethers.</p> <p>c) Thio alcohols and Thio ethers: Definition with examples. Preparation and properties of Sulphonol and Mustard Gas- Mechanism of Wittig reaction.</p> <p>d) Epoxides : Definition-Mechanism of acid base-ylides.</p> |
| Unit II | <p>Polyhalogen Derivatives:</p> <p>a. Polyhalogen derivatives: Chlorofluorocarbons –westron and Freon-Preparation and applications. Preparation and properties of CHCl_3, CHI_3 and CCl_4.</p> <p>b. Halogen derivatives of unsaturated hydrocarbons: vinyl chloride and Allyl chloride-Preparation & reactivity. Polymerisation reaction of vinyl chloride.</p> <p>c. OrganoMetallicCompounds:Grignard reagents-preparation, structure and synthetic applications, limitations, Organozinc and Organolithium compounds-preparation & synthetic applications.</p> |
| Unit III | <p>Chemistryof s-blockelements:</p> <p>a. Elements of groupIA-General discussion of elements of group IA- Diagonal relationship of Li with Mg-Anomalous behavior of ithium- extraction of lithium-properties of lithium- analytical reaction of Li.</p> <p>b. Elements of group IB-general discussion–position in the periodic table, Resemblance Among Cu, Ag, Au–Gradation in thei rproperties–Resemblance between coinage metals and the VIII group elements.</p> <p>c. Elements of group IIA–Group discussion–diagonal relationship between Be and Al Anomalous behaviourof Be–comparison Of group IA and group IIA elements.</p> |
| Unit IV | <p>Chemistry of p-block elements:</p> <p>a. General discussion of group IV elements–Preparation properties and uses of carbonyl chloride – lead monoxide – red lead – white lead.</p> <p>b. General discussion of group V elements–active nitrogen–</p> |

| | | |
|--------|---|----|
| | <p>Preparation and properties of hydrazine, hydrazoic acid and hydroxyl amine – Marsh test for arsenic.</p> <p>c. Peracids and their salts – definition – peracids of carbon – per mono and perdicarbonic acid – permono carbonates and perdicarbonates – peracids of sulphur – permono and perdisulphuric acid.</p> | 12 |
| Unit V | <p>Analytical chemistry</p> <p>(a) Theory of volumetric Analysis : Principles of volumetric Analysis – concentration units – standard solution-requirements of a primary standard solution-indicator-type of titrations & indicators-neutralization, redox, precipitation & complex formation reactions-choice of indicators in acid base titrations- complexometric titrations, EDTA Titrations-determination of hardness of water</p> <p>(b) Oxidation and Reduction:</p> <p>oxidation and Reduction – Modern electronic concept oxidation number concept – calculation of oxidation number redox reactions balancing ionic reactions involving only $\text{Cr}_2\text{O}_7^{2-}$, Fe^{2+} and MnO_4^{2-} ions in acid medium by oxidation number method. Equivalent weight of oxidizing and reducing agents.</p> | 12 |

TEXT BOOKS:

1. A Text Book of Inorganic Chemistry – R.D. Madhan
2. A Text Book of Inorganic Chemistry – P.L. Soni.

REFERENCE BOOKS:

1. Modern Inorganic Chemistry by R.D. Madhan, S. Chand & Company LTD, Ram Nagar, New Delhi, Edition 2007.
2. A text book of Organic Chemistry by B.S. Bahl and Arun Bahl.

ANCILLARY CHEMISTRY

Hours : 3 Per Week

Credit :4

Max.Marks.75(Ext) ;25(Int)

Inorganic, Organic and Physical Chemistry

Unit I :

Laboratory hygiene and safety :

Storage and handling of chemicals, handling of ethers. Toxic and poisonous chemicals. General precautions for avoiding accidents, first aid techniques- acid and alkali on eye , acid and alkali burn – Bromine burns – cut by glasses – Heat burns- Inhalation of toxic vapours- poisoning- Treatment for specific poisons- acids, alkalies, acetone, arsenic and copper compounds, cyanides.

UNIT –II

CHEMICAL BONDING

Introduction : Octet rule – Types of Chemical Bonds – Ionic, Covalent, co ordinate, hydrogen (inter and intra) and metallic bonds with few suitable Examples. Comparison between ionic and covalent bonded compounds.

Chemical bonding: Valency bond approach- types of overlapping and orbital diagrams – σ and π bonds. VSEPR theory as applied to BeCl_2 , BF_3 , CCl_4 , PF_5 and SF_6 . (Sp , Sp^2 , Sp^3 , Sp^3d and Sp^3d^2).

Molecular orbital theory: Bonding and anti-bonding molecular orbitals - MO theory applied to molecules- Hydrogen, Helium, nitrogen and oxygen.

Unit –III

Fundamental Concepts of Organic chemistry:

Tetrahedral arrangement of valencies of carbon atoms- Electrophilles and Nucleophilles

- Definition and examples- Cleavage of bond: Homolytic and Heterolytic Cleavages of Carbon bond-

Electronic effects: Inductive, Electrometric, Resonance effects and hyper conjugation- Concept of hybridization - Geometry of Organic Molecules involving hybridizations sp , sp^2 & sp^3

(eg :methane, ethylene, acetylene only).

Unit –IV

Chemotherapy (Preparation and uses only)

Sulpha drugs- sulpha diazine- antimalarials –quinine. Antibiotics: definition –penicillin- tetracycline.

Carbohydrates:

Introduction and classification – preparation and uses of monosaccharides - glucose and fructose,

Disaccharides –sucrose, polysaccharides – starch and cellulose. Conversion of Glucose to fructose only.

Aminoacids and Proteins

Aminoacids – Definition, classification.

Proteins –Definition, classifications, colour reactions and denaturation of proteins(an elementary idea only).

Unit –V

Adsorption - Definition of various terms-adsorption of gases on solids-characteristics of adsorption of gases on solids- physical and chemical adsorptions-factors influencing adsorption.

Catalysis : Definition –characteristics- theories of catalysis- types of catalysis – promoters – poisons – enzyme catalysis – applications of catalysis.

Colloidal State: Colloids definition – various types- classification – preparation by dispersion and condensation methods . Berdig’s arc method- Lyophilic and Lyophobic Colloids – differences between them – purification of colloids (electro dialysis method only) – applications of colloids.

Text Books:

1. PL. Soni, Text books of Inorganic Chemistry, S. Chand& Co., New Delhi,(2006).

Reference Books

1. Principles of physical Chemistry (23rd edition)Puri B.R., Sharma L.R., Pathania, M.S., New Delhi, ShobanLal, Nagin Chand &Co., (1993).
2. Text books of Inorganic Chemistry PL. Sony, S. Chand& Co., New Delhi,(2006).
3. Principles of Inorganic Chemistry B.R.Puri, Sharma,L.R. and Kalia, New Delhi (2002).
4. Text book of Organic Chemistry P.L.Soni and Mohan Kstyal , Sulthan Chand & Sons Educational Publishers, 20th edition 2007.

SBC - POLYMER CHEMISTRY

Hours: 5

Credits : 2

Max.Marks:25 (Int);75(Ext) .

Objectives:

1. To highlight the commercially important polymers and their various forms.
2. To understand various industrial polymerization processes.
3. To highlight on average molecular weights.
4. To know preparation and properties of commercially important polymers.

Unit – I:

Basic Concept : Monomers, Polymers, Polymerization, Degree of Polymerization,

Classification of polymers.

Plastics : Definition – Thermoplastic , Thermosetting plastics , Reinforced Plastic.

Elastomer : Definition – Natural & synthetic rubber –smoked rubber Reclaimed rubber –
Foam rubbers – Spongy rubber – Laminate rubber.

Unit –II

Adhesives : Definition – thermosetting – Thermo resins.

Fibres : Definition – Natural and synthetic, Classification comfort safety - Industrial
Fibers.

Unit III:

Ionic Polymerization : Anionic and Cationic Polymerizations . Step growth polymerisation
(Condensation polymerisation).

Co-Polymerisation : Random – Alternating Block and Graft copolymers.

Stereo Regular Polymers: Isotactic, syndiotactic & Atactic Geometrical isomers- Ziegler
Natta catalysis.

Unit IV:

Molecular weight of Polymers : Number –Average , Weight – Average – Average molecular weights. Average molecular weights and degree of Polymerisation. Molecular weight distribution GPC method – Average molecular weight and Degree of polymerisation. Determination of Average molecular weight, Light Scattering method, Viscosity method.

Unit V:

Polymer Processing Techniques: Preparation and uses of the following polymers. Polyethylene , PVC, polystyrene, Nylon-6, Nylon -6,6, Polyester, Phenol formaldehyde resins.

Reference Books:

1. Modern Organic Chemistry By- M.K.Jain and S.C.Sharma
2. Principles of Physical Chemistry By- Puri , Sharma and Pathania
3. Principles of Polymer Science By- P.Bahadur and N.V.Sastry

| | | |
|-------------------|--|---|
| Title | SEMESTER–VI SBC-HEALTH CHEMISTRY | Max.Marks:60 Pass.Min:40/100 |
| Hrs/Week | 2 | Credit:2 |
| Objectives | <ol style="list-style-type: none"> 1. To appreciate the role of chemistry in the service of humanity. 2. To understand the importance and application of various chemical compounds used in food, medicine ,dairy farm foods and in day today life. | |
| Unit | Content | Hrs |
| Unit I | FoodchemistryI: Inroduction –carbohydrates–classification- sources – uses. Proteins – occurrence characteristics–Foodadulteration-Rice,milk, butter, wheat, ghee,- contaminants and detection-Brief note on consumer awareness. | 5 |
| Unit-II | FoodChemistryII: a. Vitamins –definition–sources–classification dailyhuman requirements – deficiency diseases b. Food poisons: Introduction- chemical Food adulteration- introduction only – Bordeauxmixture,Hg,Pb,DDT,BHC, Malathion in beverages (pesticide) SMG(aginomoto). Soft drinks –soda, fruit juices, alcoholicbeverages – examples. Addiction andsocial problems. | 5 |
| Unit III | Chemotherapy: a. Antibiotics –Definition–differenttypes– penicillin- tetracyclines – sulphadrugs – | 5 |

| | | |
|--------------------|--|----|
| | <p>classification–sulphadiazine–sulphanilamide – applications.</p> <p>b.Antimalarials–typesofmalariatheraphy–</p> <p>Chloroquine–plasmoquine–applications,c.Antipyrectics and Analgesis – Definition – paracetamol– uses.</p> <p>d.Anesthetics–types–uses.</p> <p>e.Antiseptics–Disnfectants–Definitions .</p> | |
| Unit IV | <p>a.Milk-Compositionofmilk,milk processing, pasteurization .</p> <p>b.Fire protection – Majorcauses of fire fightinginhomes–laps–methodsof extinguishingfire–chemical/gasfire extinguishing .</p> | |
| Unit V | <p>Commonlyusedchemicalsindaytodaylife:</p> <p>Healthbenefits and ill effects – common salt– bakingsoda–vinegar–preservatives–soda water- sucrose – flavoringagents -importance and uses soaps and detergents – phenoyl – inkvimhouse hold – Teflon and aluminium (Altheimers disease) .</p> | 5 |
| | Totalhouse/ Semester | 25 |
| Course book | Study material prepared by the department | |

SEMESTER – IV COREPAPER -V
ORGANIC CHEMISTRY-II

Objectives:

- 1. To study preparation, properties and reactions of aldehydes, ketones, carboxylic acids and aliphatic nitrogen compounds.**
- 2. To study and analyse aromatic compounds and some of its derivatives like hydrocarbons, halogen, nitro and amino compounds.**
- 3. To know the synthetic applications of some organic compounds.**

Content

UNIT-I

Aliphatic aldehydes and ketones

- a) Nomenclature- electronic structure of carbonyl group. Preparation of aldehydes and ketones from fatty acids by oxidation of diols and from Grignard reagents. Relative reactivities of aldehyde and ketones. Mechanism of nucleophilic addition of carbonyl compounds with HCN, Hydride transfer reactions with examples. Cannizaro reaction, Grignard reagent addition reactions. Halogenation, Iodoform reactions.
- b) Name reactions- MPV- Oppenaur reaction-Wolf kishner reduction – Clemmenson reduction and aldol condensation.
- c) Chemistry of Acrolein, Crotonaldehyde, glyceraldehydes, Glyoxal and Acetylacetone.

UNIT – II

Aliphatic carboxylic acids

- a) Structure of carboxylic acid- Acidity of carboxylic acid-effect of substituents on acidity – Comparison of strength of carboxylic acids. Preparation of acids by hydrolysis of esters and nitriles, Carbonation of Grignard reagent. Preparation and properties of Acid chlorides, anhydrides, amides and esters.
- b) **Halogenacids:**
HVZ reaction, hydrolysis of mono, di and trichloroacetic acids.
- c) **Aminoacids:** Action of heat on α , β and γ -amino acids.
- d) **Hydroxyacids:** Action of heat on α , β and γ -hydroxy acids.
- e) **Dicarboxylic acids:** Action of heat on dicarboxylic acids: Blanc's rule, Dieckmann condensation, Reformatsky reaction.

f) Synthetic applications of: Acetoacetic ester and malonic ester.

UNIT-III

Aliphatic Nitrogen Compounds:

a) Alkyl cyanide and isocyanides:

General methods of preparation and properties. Thorpe nitrile condensation.

b) Amines:

Classification- Preparation of amines by Hofmann Exhaustive methylation degradation – Gabriel phthalimide synthesis and Leuckart reaction.- Separation of 1^o, 2^o and 3^o Amines- Basic character of amines. Preparation and uses of ethylene diamine and hexamethylene diamine.

c) Diazo compounds

Preparation and synthetic applications of Diazomethane and diazo acetic ester.

d) Urea: Structure, estimation and uses.

UNIT-IV

Aromatic Compounds

a) Introduction-

General characteristics of aromatic compounds. Aromaticity and Huckel's Rule. Structure of benzene.

b) Mechanism of aromatic electrophilic substitution reactions-

Halogenation, Nitration, Sulphonation and Friedel-Crafts Reactions.

c) Directive influence of Substituents on Monosubstituted benzene.

d) Mechanism of aromatic nucleophilic substitution-Bimolecular and Benzyne mechanism.

e) Preparation, Properties and uses of Xylene, Toluene and Mesitylene.

UNIT-V

Aromatic Halogen, Nitro and Amino compounds

a) Aromatic Halogen compounds:

Preparation, properties and uses of Chloro benzene and Benzyl bromide- BHC and DDT. Reactivity of aryl halides. Differences between nuclear and side chain halogenated derivatives.

b) Aromatic Nitro compounds:

Preparation and properties of nitrobenzene and nitro toluenes.

c) Aromatic amino compounds:

Preparation by reduction of nitro compounds and from Chloro benzene. Effect of substituents on the basic character of aromatic amines. Comparison of aliphatic and aromatic amines.

d) Preparation and synthetic applications of Benzene diazonium chloride.

Reference Books:

1. I.L.Finlar 'Organic Chemistry' Vol-I&II, (16th edition) England, Addison Wesley Longman Ltd., (1996).
2. Morrison R.T. Boyd R.N., Organic Chemistry (6th edition) New York, Allyn & Bacon Ltd., (2006).
3. Bahl B.S., Arun Bahl, Advanced Organic Chemistry (12th edition) New Delhi, Sultan Chand and Co., (1997), (Text Book).
4. Organic Chemistry, P.L.Soni, Sultan Chand & Co. Edition 2006. (Text Book).
5. Pine S.H., Organic Chemistry (4th edition) New Delhi. McGraw – Hill international Book Company. (1996)
6. Seyhan N.Ege, Organic Chemistry, New York, Houghton Mifflin Co., (2004).
7. E.L.Eliel 'Stereochemistry of carbon compounds'.
8. B.M.Silverstein G.C.Bassler and T.C.Morrill, 'Spectrometric Identification of Organic Compounds'
9. R.O.C.Norman 'Organic Synthesis'
10. S.H.Pine, J.B.Hendrickson, D.J.Cram and G.S.Hammond 'Organic Chemistry'.
11. Raj K Bansal, Reactions and reagents.

SEMESTER-IV CORE - VI

PHYSICAL CHEMISTRY-I

UNIT-I: PHASE RULE

(a) Definition of terms – Gibb's phase rule-one component system-water, carbon-di-oxide- polymorphism-two component system-reduced phase rule-simple eutectic system-Pb-Ag system, KI-Water system-system involving compound formation with congruent and incongruent melting point-Zn-Mg system-CuSO₄.5H₂O dehydration phase diagram.

(b) Partially Miscible liquid system-CST-completely immiscible liquid system

(c) Physical properties and chemical constitution

Dipole moment-Definition-electro chemical polarization of molecules-Debye-Hückel equation- Debye equation-Experimental determination-moment of linkage and groups-various applications.

(d) Magnetic moment : Magnetic susceptibility-para, dia and ferro magnetism-specific, molar magnetic susceptibility and constitution- determination by Gouy's method-various applications(any 2).

UNIT-II: THERMODYNAMICS –I:

(a) Introduction : Types of systems-state of a system-thermodynamic or state variables – extensive and intensive properties-state and path functions-exact and inexact differentials- thermodynamic process-reversible and irreversible processes- work, heat and energy.Zeroth law of thermodynamics and its significance.

(b) Thermochemistry : Significance of Hess's law of constant heat of summation-Kirchoff's equation-bond enthalpies and energies.

(c) Law of mass action-Relation between K_c and K_p-Lechatlier principle and its application to Haber's process-common-ion effect in ionic equilibria.

UNIT-III: FIRST LAW OF THERMODYNAMICS :

Statement-mathematical formulation-internal energy- enthalpy or heat content- heat changes at constant volume and at constant pressure-relationship between C_p and C_v –work done ,heat changeand enthalpy change for reversible isothermal expansionand compression of an ideal gas– calculationof q, w, e, H foradiabaticexpansionofanidealgas-relationbetween 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 Thomson effect-Joule Thomson co-efficient in the case of ideal gas and real gases-inversion temperature.

UNIT– IV :SOLUTIONS

Definition – terms involved –Dissolution of substances-Temperature and solubility-solubility of gases in liquids-mole fraction,weight percentage,mole percentage ,parts per million-Gaseous solutions- solutions of gases in liquids – Henry’s law-ideal solutions-Raoult’s law of ideal solutions-Solutions of liquids in liquids in liquids-relation between the mole fractions of the componentsintheliquid&vapourphases–non-ideal solutions-Activityco-efficients- Definition of melting point, boiling point, elevation in boiling point, depression in freezingpoint- ebullioscopic and cryoscopic constant.

UNIT– V :PHOTOCHEMISTRY

Definition of various terms – consequence of light absorption : The Jablonski Diagram –light absorption by solutions- Beer-Lambert law – limitations of Beer-Lambert law – laws of photochemistry—Quantum yield-Experimental determination of quantum yields-photochemical rate law-kinetics of photochemical reactions (onlyfor Hydrogen-Chlorine reaction).Ozone layer in stratosphere –Energy transfer in photochemical reactions-photosensitisation and Quenching- Quenching of Fluorescence –Chemiluminescence- rates of intramolecular photophysical processes and intermolecular energy transfer-The Laser and the Maser- Applications of Laser in Chemistry.

TEXT BOOKS:

1.Text book of Physical Chemistry by P.L.Soni and O.P.Dharmarha ,published by Sultan Chand & Sons,New Delhi,2005

2. Principles of Physical Chemistry by Puri, Sharma and Pathania, Vishal Publishing Co.,Jalandar,2013.

REFERENCE BOOKS:

1. Principles of Physical Chemistry by Abhijit Mallick,Viva Books Private Limited,01.01.2018.

2. Physical Chemistry by Peter Atkins,Julio de Paula and James Keeler,Oxford University Press,01.07.2018

MAJOR PRACTICAL – II – VOLUMETRIC AND ORGANIC COMPOUND ANALYSIS

Hours : 3

Credit :5

Max.Marks. 60(Ext) ;40(Int)

VOLUMETRIC ANALYSIS :

1. Preparation of standard solutions of various normality.
2. Acidimetry – Estimation of HCl / H₂SO₄
3. Alkalimetry – Estimation of Na₂ CO₃/ NaOH.
4. Permanganometry – Estimation of Oxalic acid , Fe²⁺
5. Estimation of ferrous ion by external indicator.
6. Dichrometry – Estimation of CuSO₄ (Demo only).

ORGANIC QUALITATIVE ANALYSIS

1. Carboxylic acids (Monocarboxylic - Benzoic acid,dicarboxylic- Phthalic acid)
2. Ketones (benzophenone), Aldehydes - Benzaldehyde), Amines- Primary Aromatic amine – Aniline, Amides (Aliphatic – Urea,Aromatic mono amide-Benzamide), Monohydric phenols- phenol.
3. Bifunctional groups – Salicylic acid.
4. Carbohydrates – Glucose and Sucrose.
5. Preparation of solid derivatives

Reference Books:

1. Basic Principles of Practical Chemistry by – V.Venkateswaran, R.Veerarwamy , and A.R. Kulandaivelu

COURSE OBJECTIVES:

- 1.To gain practical skills on volumetric analysis and qualitative analysis

SEMESTER – IV

Ancillary Chemistry - IV

Hours : 5

Credit :4

Max.Marks.75(Ext) ;25(Int)

Inorganic, Organic and Physical Chemistry

Unit –I:

Industrial Chemistry

Fuel Gases:- Preparation and uses of Natural Gas ,Water gas, Producer gas, Semi- water gas, Carbonated water gas & oil gas.

Fertilizers:- Manufacture and uses of Urea - Ammonium sulphate, Ammonium nitrate, Super phosphate of lime- Triple super phosphate and potassium nitrate.

Silicones :- Definition-Types-Preparation, properties and uses.

Unit II :

Metallurgy:

Occurrence of metals- minerals and ores- steps involved in metallurgical process- concentration – calcinations – roasting – reduction to free metal—refining of metals- electrolytic refining- Van Arkel process.

Titanium – Ores – Extraction of titanium from Rutile Ore and from ilmenite Ore. Uses of titanium.

Vanadium – Ores - Extraction of vanadium from carnotite Ore and from vanadinite ore. Uses of vanadium- Tungsten – Ores- Extraction of Tungsten from wolframite Ore- uses of Tungsten.

Unit –III :

Organo metallic compounds – Grignard reagents – preparation - properties- structure and synthetic uses of Grignard reagents- Limitations of Grignard Synthesis.

Polymer Chemistry

Introduction – Types of Polymerisation – Plastics- definition - types – difference between thermoplastics and thermosetting Plastics- preparation and uses of polyethylene, PVC, PVA and Nylon - 66.

Unit –IV

Soaps and Detergents:

Soap- Definition – Saponification - manufacture of soap – Hot and Cold process - Difference between toilet soap and laundry soap- Types of Soaps - Cleaning action of Soap- Synthetic Detergents – composition of a common Detergent and Types- Differences between soaps and detergents.

Unit V:

Physical Chemistry:

Thermodynamics:-System-types of system-Work and Heat-Spontaneous and Non-Spontaneous changes, Reversible and Irreversible changes, Isothermal and Adiabatic changes- Statement and Mathematical expression of first law of thermodynamics-Statement of second law of thermodynamics.

Photo Chemistry:-Definition –Grotthus -Draper's law –Law of photochemical equivalence- Quantum yield-Photo chemical reactions-Photo sensitisation –Chemiluminescence- Fluorescence, Phosphorescence.

Reference Books:

1. A Text Book of Organic Chemistry by - M.K Jain & S.C.Sharma
2. A Text Book of Inorganic Chemistry by - R.D. Madhan
3. A Text Book of Physical Chemistry by - P.L. Soni

Ancillary Chemistry Practicals

Volumetric Analysis and Qualitative Analysis of Organic Compound

Hours : 2+2

Credits : 4

Max.100 Marks (Ext: 60 & Int: 40)

Volumetric Analysis :

1. Acidimetry – Estimation of HCl.
2. Alkalimetry- Estimation of NaOH.
3. Permanganometry- Estimation of Oxalic Acid, Fe^{2+} , FAS and FeSO_4 .

Organic Qualitative Analysis :

1. Mono Carboxylic Acid – Benzoic Acid.
2. Urea.
3. Aromatic Mono Amide- Benzamide.
4. Carbohydrates - Glucose and Sucrose.

Reference Books:

1. Basic Principles of Practical Chemistry by- V.Venkateswaran, R.Veerawamy, and A.R.Kulandaivelu.

Course Objectives:

To gain practical skills on volumetric analysis and qualitative analysis.

SBC - FORENSIC SCIENCE

Hours : 2

Credits : 2

Max.100 Marks (Ext: 75 & Int: 25)

UNIT 1: POISONS

Poisons – types and Classification – diagnosis of poisons in the living and the dead – clinical symptoms- postmortem appearances. Heavy metal contamination (Hg, Pb, Pd) of sea foods – use of neutron activation analysis in detecting Arsenic in human hair. Treatment in cases of poisoning–use of antidotes for common poisons.

UNIT 2: CRIME DETECTION

Accidental explosion during manufacture of matches and fire works (as in Sivakasi). Human bombs- possible explosives (gelatin sticks and RDX) – metal defector devices and other security measured for VVIP – composition of bullets and detecting powder burners. Analysis of incendiary and timed bombs- spill of toxic and corrosive chemicals from tankers.

UNIT 3 FORGERY AND COUNTERFEITING

Documents – different types of forged signature – simulated and traced forgeries – inherent signs of forgery methods – writing deliberately modified – uses of ultraviolet rays – comparison of type written letter – checking silver line water mark in currency notes- alloy analysis using AAS to detect counterfeit coins- detection of gold purity in 22 carat ornaments – detecting gold plated jewels.

UNIT 4: TRACKS AND TRACES

Tracks and traces- small tracks and police dogs – foot prints – casting of foot prints – residue prints- residue prints, walking pattern or tyre marks – miscellaneous traces and tracks – glass fracture – tool marks- paints – fibres – analysis of biological substances – blood, semen, saliva, urine and hair – Cranial analysis (head and teeth) DWA Finger printing for tissue identification in dismembered bodies- detecting steroid consumption in athletes and race horses.

UNIT 5 MEDICAL ASPECTS

Aids- Causes and prevention - misuse of scheduled drugs – burns and their treatment by plastic surgery . Metabolite analysis using mass spectrum- gas chromatography. Arson – natural fires and arson – burning characteristics and chemistry of combustible materials – nature of combustion.

Ballistic – Classification - internal and terminal ballistics – small arms- laboratory examination of barrel washing and detection of powder residue by chemical test.

TEXT BOOKS:

1. Forensic Science Principles and applications by Dr.Nishant Singh, Ancient Publishing House, 01.01.2011.

REFERENCE BOOKS:

1. T.H. James, Forensic Sciences , Stanley Thornes Ltd.,
2. Richard, Criminalistics – An introduction to Forensic Science (College Version), 8th Edition Sofestein , Printice Hall.,

SEMESTER – V

Core Paper- IX - Organic Chemistry – II

Hours : 6

Credits : 5

Max.100 Marks (Ext: 75 & Int: 25)

Unit – I

Alicyclic compounds:

General methods of preparation and properties of Cycloparaffines- Baeyer's strain theory and its modification

Poly nuclear hydrocarbons and their Derivatives:

Isolated Systems- Preparation and properties of Biphenyl , biphenyl methane and triphenyl methane.

Condensed systems: Preparation, properties, uses and structural elucidation of Naphthalene and Anthracene, preparation , properties and uses of Naphthylamines and Naphthols.

Uses of reagents in organic synthesis : SeO_2 , OsO_4 N – bromo succinimide, Lead tetra acetate and raney Ni.

Unit – II Aromatic compounds (Aldehydes and phenols)

Aromatic aldehydes: Benzaldehyde – mechanism of Cannizaro, Perkin, Claisen reaction and Benzoin condensation .

Preparation & properties of cinnamaldehyde and vanillin.

Phenols: Acidity of Phenols – effect of substituents on the acidity of phenol , mechanism of Kolbe's reaction. Reimer –Tiemann reaction . Test for phenol – estimation of Phenol.

Unit – III Aromatic Acids

Effective of substituents on acidic character.

Substituted acids : Preparation , properties of salicylic acid and anthranilic acid.

Dicarboxylic acids : Isomers of Phthalic acid, preparation , properties of phthalic acid – derivatives of phthalic acid- phthalic anhydride & phthalimide. Preparation, properties and uses.

Preparation & Properties of Phenylacetic acid, Mandelic acid, cinnamic acid and coumarin.

Aromatic sulphonic acids: Preparation and uses of benzene sulphonic acid, saccharin - chloramine - T & dichloramine – T.

Unit – IV Stereoisomerism:

Geometrical isomerism:

Definition – geometrical isomerism of maleic and fumaric acids- aldoximes and ketoximes- determination of configuration of geometrical isomerism – E, Z notations.

Optical isomerism : Definition - Optical activity – Chirality – Enantiomers, diastereoisomers – elements of symmetry – Plane of symmetry , axis of symmetry and centre of symmetry – specific rotation and its polarimetric determination.

Optical isomerism of compounds containing asymmetric carbon atom racemisation and resolution of racemic mixtures – Walden inversion – asymmetric synthesis – specification of absolute configuration by R and S notations.

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

Unit – V: Conformational Isomerism:

Differences between configuration and conformation . Fischer, Saw- horse and Newmann projection formulae – conformational analysis of ethane, n – butane and Cyclohexane.

Tautomerism : Definition – condition of tautomerism - prototropy and differences between Tautomerism and Resonance – types of tautomerism.

Keto – Enol & Nitro – acinitro Tautomerism.

REFERENCE BOOKS:

1. A Text Book of Organic Chemistry By – M.K. Jain and S. C.Sharma
2. A Text Book of Organic Chemistry By – P.L. Soni
3. A Text Book of Organic Chemistry By – K.S.Tewari

SEMESTER – V

CORE PAPER – X- INORGANIC CHEMISTRY – III

Hours : 6 Per Week

Credits : 5

Max.100 Marks (Ext: 75 & Int: 25)

UNIT – I : Non aqueous Solvents

Classification of solvents –liquid ammonia as solvent-chemical reaction that occur in liquid ammonia .

Liquid sulphur dioxide as solvent –solubility of inorganic materials in liquid sulphur dioxide –solubility of organic compounds in liquid sulphur dioxide –chemical reaction that can occur in liquid sulphur dioxide.

UNIT – II : Halogens

Position of halogen in the periodic table –anomalous behaviour of fluorine –difficulties in the isolation of fluorine –modern method of isolation of fluorine –estimation of available chlorine in bleaching powder –structure –properties and uses of perchloric acid –potassium perchlorates .

Oxides and oxyacids of bromine –brominating mixture –periodic acid –preparation – properties –uses –inter halogen compounds –polyhalides –pseudohalogens –basic iodine – comparative study of halogens.

UNIT – III : Chemistry of Boron Family

Group discussion –electron acceptor behavior and Electron deficiency of Boron hydrides bonding in diboranes. NaBH_4 , LiBH_4 – Preparation - properties, structure and uses of Borozoles.

Comparison between Carbon & Silicon - hydrides of silicon and silicates structure.

Classification of silicates and its applications (elementary study only)

Unit – IV : Fluorocarbons

Fluorocarbons- Definition – Synthesis – Properties and uses of fluorocarbons.

Inert gases – occurrence- isolation of rare gases from dry air and from liquid air – uses of inert gases. Clathrates: Types – preparation and uses.

Unit – V: Consumer Chemistry

Food adulteration – Types of adulteration – intentional adulteration – metallic contamination – incidental adulteration – food laws and standards.

Beverages and appetizers – Classification - carbonated non – alcoholic beverages – miscellaneous beverages – alcoholic beverages.

TEXT BOOKS:

1. A Text Book of Inorganic Chemistry by – R.D.Madhan , P.L. Soni
2. A Text Book of Inorganic Chemistry by – P.L.Soni
3. A Text Book of Inorganic Chemistry by – Puri & Sharma

Reference Books:

1. Modern Inorganic Chemistry by R.D. Madhan, S. Chand & Company LTD, Ram Nagar, New Delhi, Edition 2007.

ELECTIVE: I

ANALYTICAL CHEMISTRY AND ELEMENTS OF ORGANIC

Hours : 5

Credits : 4

Max.100 Marks (Ext: 75 &

Int: 25)

Unit –I :Introduction To Analytical chemistry:

Types of analytical methods : Importance of analytical methods is Qualitative and Quantitative analysis - chemical and instrumental methods - advantages and limitations of chemical and instrumental methods

Simple First Aid procedure for accidents involving acids , alkalis , bromine, burns and cut by glass. Carcinogenic chemicals – toxic and poisonous chemicals-First Aid Technique for poisoning – methods of expressing precision waste disposal – fume disposal-methods only.

Evaluation of Analytical data : 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 limit.

UNIT – II:

Quantitative analysis:

Estimations of commercial samples- Determination of percentage purity of samples – pyrolusite –Iron ore – washing soda and Bleaching powder estimation of glucose and phenol. Gravimetric analysis – Principle – Theories precipitation – solubility product and precipitation – conditions of precipitations – Types pf Precipitation – purity of precipitates – Co-precipitation – Post Precipitation – precipitation from homogeneous solution – use of sequestering agents

Unit - III

Spectroscopy - I

UV spectra: Allowed electronic transitions – conditions for a molecule to be UV active – absorption maxima (max) – applications of UV spectra.

IR spectra – spectral range – conditions for a molecule to be IR active – mode of vibrations – calculations of IR bands for water and carbon - di- oxide molecule. Finger print region – IR frequency range of functional groups like aldehydes, ketones , acids, acidamide and primary amines only.

NMR spectra – conditions for a molecule to be NMR active equivalent and non-equivalent protons – splitting of NMR signals – detailed study of NMR spectrum of ethanol – importance of reference compound TMS (Tetra methyl silane) – applications of NMR spectra.

UNIT – IV:

Spectroscopy - II

Mass spectroscopy – Base peak, molecular ion peak and isotopic peak. Spectrum of neopentane , benzene and ethyl bromide Raman spectra – theory of Raman Spectra –stoke and anti-stoke lines – conditions for a molecule to be Raman active – comparison of Raman and IR spectra. Applications of Raman spectra only in structural equilibria and mechanism of tautomerism.

ESR spectra – conditions for a molecule to be ESR active – ESR spectrum of methyl radical and naphthalene ion – application of ESR

Unit – V:

Chromatography Techniques :

Column/chromatography- principle, types of adsorbents, preparation of the column, elution , recovery of substances and applications. Thin layer chromatography – principle, choice of adsorbent and solvent, preparation of chromatoplates , Rf – values Paper chromatography- principle, solvents used ,Development of chromatogram, ascending and descending paper

chromatography. Gas chromatography – principles ,Experimental techniques. High pressure Liquid chromatography – (HPLC)- principles – Experimental techniques.

REFERENCE BOOKS:

- 1.Douglas A.Skoog and Donald M.West, F.J. Holler, Fundamentals of Analytical Chemistry, 7th edition , Harcourt College publishers.
- 2.Mendham J.,Denney R.C.,Bames J.D.,Thomas M., Vogel's Text book of Quantative chemical analysis 6th edition, Pearson education.
- 3.sharma B.K.,Instrumental methods of chemical Analysis , Coel publishing House, Merrut.(1997)
4. Gopalan R.,Subramaniam , P.S and Rengaraj k., Elements of Analytical Chemistry,Sultan Chand and Sons.
5. Usharani S., Analytical Chemistry,Macmillon.

ELECTIVE – II-
PHARMACEUTICAL CHEMISTRY

Hours: 5

Credits: 4

Max.100 Marks (Ext: 75 & Int: 25)

Unit I:

Terminologies used in pharmaceutical chemistry-pharmacology-pharmacognosy-pharmacy-pharmacodynamics-therapeutics-toxicology-chemotherapy-pharmacopoeia-national-formulary(BNF,NF of india british pharmaceutical codes AMA drug evaluation),therapeutic index,LD₅₀, ED₅₀,grams test, bacteria, virus, immunity, vaccines and toxoids . pharmacophore, antimetabolite.

Unit II:

Traditional practice –sidda , ayurveda and unani.Medicinally important compounds of Al, P,As, Hg and Fe and its uses

Blood-blood grouping –Rh factor-buffers in blood, maintenance of pH of blood-composition of blood-clotting mechanism-blood pressure(normal, high and low and control of B.P)

Unit III:

Analgesics: Definition classification ,action of analgesics-narcotic analgesics (morphine and its derivatives with reference to SAR) synthetic analgesics- preparation, assay and uses of pethidines and methadones. Antipyretic analgesics-salicylic acid derivatives,indole derivatives &p-amino phenol derivatives.

Antiseptics and disinfectants-Definition and distinction, standardization of disinfectants. Use of phenols,dyes, chloramines, dequalinium chloride, formaldehyde and cationic surface active agent

Unit IV:

Anaesthetics :Definition and classification.

Uses of volatile anaesthetics –ethers, halohydrocarbons – chloroform ,halothane ,trichloroethylene , ferguson principle.

Gaseous anaesthetics:Cyclopropane, N_2O - preparation ,advantages, adverse, effect and assay of N_2O .

Non volatile anaesthetics:Intravenous anesthetics-preparation of thiopental sodium and methohexitone.

local anesthetics: Classification, structure, preparation and uses of procaine, derivatives of procaine, benzocaine and cocaine.

Unit V:

Transquilisers - classification in detail.

Sedatives and hypnotics-distinction, definition, classification of hypnotics-structure and uses of barbiturates and non barbiturates

Haematological agent: Anticoagulants and coagulants drugs

Antianaemic Drugs: iron,vitamin- B_{12} and folic acid

Cardiovascular drugs-examples and uses.

Aids: causes,prevention and treatment

Reference Books :

1. Pharmaceutical Chemistry by Dr.Rajeev Kumar
2. A textbook of Pharmaceutical Chemistry by Jayshree Ghosh

Part – IV

SBC- Pulp and Paper Technology

Hours : 2

Credits : 2

Max Marks: 75(Ext); 25(Int)

Unit 1:

Introduction – Raw material – Manufacture of Pulp- Mechanical process – Chemical Process.

Unit II:

Types of Pulp -Sulphite Pulp , Soda Pulp and Rag Pulp.

Unit III.

Manufacture of Paper- Various steps in the manufacture of paper -Bleaching ,Beating , Refining , Filling, Sizing ,Calendaring and Colouring of Paper.

Unit IV:

Uses of Paper

Unit V:

Preparation of Heavy Paper – Paper industries in India.

Industrial Visit & submission of report is mandatory.(5 Marks- Internal)

Reference Books :

1. Industrial Chemistry by B.K .Sharma

SEMESTER – VI

ORGANIC CHEMISTRY - III

Hours : 6 Per Week

Credits : 5

Max.100 Marks (Ext: 75 & Int: 25)

Pass. min:40/100

- Objectives:**
1. To understand the preparation , properties, reactions and importance of Alicyclic compounds , and poly nuclear hydrocarbons .
 2. To introduce the concept of conformational analysis .
 3. To study the different molecular rearrangement reactions .
 4. To study the preparation properties and uses of Terpenes , Nucleic acids and proteins .

Unit I Carbohydrates :

- a. Introduction and classification : Monosaccharide – preparation , properties and constitution of glucose – configuration – configuration structures – interconversion of glucose and fructose – descending and ascending of sugar series – Epimers and anomers – epimerization - mutarotation .
- b. Disaccharides : preparation , properties constitution and configuration of sucrose .
- c. Polysaccharides : A general study of starch and cellulose – uses of cellulose in industries .

Unit II

- a. Molecular rearrangements: Detailed mechanisms of the following : pinacol – pinacolone , Hofman , benzyl – benzoic acid , claisen , Beckmann and Fries arrangements .
- b. Free radicals – Definition – preparation and reaction of short lived and long lived free radicals – stability of free radicals – detection of free radicals – Mechanism of Sandmeyer reaction .

Unit III Dyes :

- i) Definition - theory of color and constitution – classification of dyes according to structure and applications .
- ii) Azodyes - preparation of congo red and bismark brown.
Triphenyl methane dyes : Preparation of malachite green , rosaniline .
- iii) Phthalein dyes: phenolphthalein , fluorescein preparation .
- iv) Vat dyes – preparation of Indigo .

Unit IV

- a. Heterocyclic compounds: preparation and properties of pyrazole , pyridine , quinoline and isoquinoline .
- b. Alkaloids: Definition : Occurrence and extraction of alkaloids – general methods for determining the structure of alkaloids – classification of alkaloids – structure and synthesis of following alkaloids - conine , piperine and papavarine (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 structural elucidation of citral , geraniol, terpenol and menthol .
- b) Proteins , nucleic acids and amino acids :
 - i. Amino acids – definition , classification – preparation and properties of Glycine , Alanine.
 - ii. Definition – classification of proteins – color reactions of proteins – primary , secondary , tertiary and quaternary structure of proteins . Denaturation of proteins (an elementary idea only) .

Reference Books:

1. A Text Book of Organic Chemistry By- M.K.Jain & S.C.Sharma
2. A Text Book of Organic Chemistry By- P.L.Soni

CORE PAPER – XIII - PHYSICAL CHEMISTRY – II

Hours : 6

Credits : 5

Max.100 Marks (Ext: 75 & Int: 25)

UNIT – I SPECTROSCOPY:

The Electromagnetic spectrum- Absorption Spectroscopy- Mechanism of interaction of Radiation with Materials- Molecular spectra – Molecular Rotation – Types of molecular Spectra – Rotational Spectra of Diatomic molecules (Microwave Spectra) Rigid Rotator – The intensities of spectral lines- the Effect of Isotopic Substitution – Non- rigid Rotator.

Unit – II:

Vibrational Spectra (Near infra red spectra) – Simultaneous Rotation and Vibration in molecules – Diatomic Vibrating Rotator – Diatomic molecule as a Harmonic oscillator and Rigid Rotator– Diatomic molecule as Abharmonic oscillator and a Non – Rigid Rotator – Rotational Degree of freedom- Spectra and Vibrational modes- Analysis of Infra – red spectra on the Basis of modes of vibration- Electronic spectra – Light scattering and Raman Spectroscopy .The laser and the Maser, Comparison Of Raman Spectroscopy with IR spectroscopy.

Unit – III Quantum Mechanics:

Failure of classical mechanics, black body radiation, photoelectric effect, Compton effect, Heisenberg uncertainty principle, Schrodinger wave equation , Eigen value and Eigen functions, Significance of wave function , postulates of quantum mechanics, energy and wave functions of particle in one dimensional box.

Unit IV : Chemical kinetics and Colloidal State

Chemical kinetics:

Second order reactions – rate equation derivation – half life period derivation – examples. Third order reactions- rate equation derivation- example. Effect of temperature on reaction rates – Arrhenius equation – theories of reaction rates – collision theory and Activated complex theory of bimolecular gaseous reactions- Lindemann theory of unimolecular gaseous reactions.

Colloidal State:

Colloidal systems – preparation of lyophilic colloids by dispersion and condensation methods – purification of colloids – properties – electrical, kinetic and optical – Determination of size of colloidal particles by ultra filters, Brownian movement and light scattering methods. Emulsion – types of emulsion – properties – Gels- preparation and application of colloids.

Unit V : Liquid Crystals:

Definition – types-nematic and smectic, the seven segment cell- classification of thermotropic liquid crystals- Polymorphism in thermotropic liquid crystals- pressure induced mesomorphism . Molecular arrangements in various states of liquid crystals.

TEXT BOOKS:

1. Text book of Physical Chemistry by P.L.Soni and O.P.Dharmarha ,published by Sultan Chand & Sons, New Delhi,2005
2. Principles of Physical Chemistry by Puri, Sharma and Pathania, Vishal Publishing Co.,Jalandar,2013.

REFERENCE BOOKS:

1. Basics of Spectroscopy by B.K. Sharma
2. Advanced Spectroscopy by Aluwalia
3. Physical Chemistry by Bahl & Arun Bahl.
4. Principles of Physical Chemistry by Abhijit Mallick,Viva Books Private Limited,01.01.2018.
5. Physical Chemistry by Peter Atkins,Julio de Paula and James Keeler,Oxford \ University Press, 01.07.2018

SEMESTER – V & VI

PRACTICAL –III-GRAVIMETRIC ANALYSIS AND ORGANIC COMPOUND PREPARATION

Hours : 3+3 Credits : 5

Max.100 Marks (Ext: 75 & Int: 25)

Course Objectives:

To Gain practical Skills on Gravimetric Analysis and in organic Compound Preparations.

Gravimetric Analysis

1. Estimation of lead as lead Chromate.
2. Estimation of barium as Barium Chromate.

Organic Compound Preparation

1. Preparation of benzoic acid from
Benzamide (Amide Hydrolysis)
Ethyl benzoate (Oxidation)
Benzaldehyde (Oxidation)
2. Preparation of β – Naphthyl Benzoate from β – naphthol.
3. Preparation of Benzanilide form Aniline.
4. Preparation of Phenyl Benzoate form Phenol.

Reference Books:

1. Basic Principles of Practical Chemistry By - V.Venkateswaran, R.Veerawamy and A.R.Kulandaivelu.

PRACTICAL –III-PHYSICAL CHEMISTRY PRACTICALS

Hours : 3+3

Credits : 5

Max.100 Marks (Ext: 75 & Int: 25)

PHYSICAL CHEMISTRY PRACTICALS- LIST OF EXPERIMENTS:

1. Critical Solution Temperature (CST)
2. Effect of impurity on Critical solution Temperature
3. Transition Temperature (T.S.)
4. Rast Method –Determination of Molecular Weight
5. Phase Diagram (Simple eutectic system)
6. Kinetics of Ester Hydrolysis –Determination of Rate Constant
7. Conductometric Acid-Base Titration –Determination of Strength of an Acid/Base
8. Potentiometric Redox Titration –determination strength of FeSO_4 / Ferrous Ammonium Sulphate.

APPLICATION ORIENTED EXPERIMENTS:

1. Determination of melting point of organic and inorganic solid substances.
2. Determination of boiling point of organic and inorganic liquidsubstances.
3. Estimation of hardness of water by EDTA titration method.
4. Estimation of TDS of water samples using TDS meter.

Scheme for External Evaluation-Record Note Book:10,Procedure with Formula:20,Performance of the Practicals:20,Result :10 Error Limit $\pm 10\%$

Reference Books :

1. Venkateswaran V. Veerasamy R. Kulandaivelu A.R., Basic principles of Practical Chemistry, 2nd edition, New Delhi, Sultan Chand & sons (1997)
2. Practical Chemistry for B.Sc., students A.O. Thomas, Scientific Book Centre,Cannnore,1992.

COURSE OBJECTIVES:

To gain practical skills in physical chemistry experiments and also to apply this in various fields for their career.

ELECTIVE : 3 - INDUSTRIAL CHEMISTRY

Hours : 5

Credits : 4

Max.100 Marks (Ext: 75 & Int: 25)

Objectives:

To make the students well- grounded in the principles and through knowledge of scientific techniques of industrial chemistry.

Unit – I :Glass and Ceramics : Glass – General properties of glass – types of glasses – manufacture of glass – Ceramics – classification – clay products – white wares – chemical store wares - plasticity of clay – manufacture of white pottery, glazing, Earthen wares.

Refractories: Definition –classification, properties of refractories – manufacture of refractories, fire clay bricks manufacture, uses of fire clay refractories - High alumina refractories – uses – silicon carbide refractories - properties and use.

Unit – II: Paints and varnishes: Paint – definition – classification of paints based on their applications – constituents – Requisites of a good paint – emulsion paints Varnishes – Definition – constituents of varnish – characteristics of a good varnish – uses – japans varnish. Enamel - definition – Types, Ingredients and uses.

Pigments: Definition – composition, characteristics and uses of white lead, zinc oxide, Lithopone and TiO_2

Unit – III: Soap and Detergents: Soap – Definition – General consideration in soap making – manufacture of soap – Hot and Cold process – transparent soaps - properties. Detergents – Definition – classification of face active agents cleaning action of soap deference between soap & detergents. Silicones: Preparation & uses.

Unit – IV: Portland Cement: Introduction – types of cements composition manufacture & setting of cement.

Corrosion: Dry and Wet corrosion – Electrochemical theory of Corrosion- Mechanism – Galvanic corrosion, Concentration cell corrosion Waterline Attack – Pitting – passivity- stress corrosion – Corrosion control methods.

Unit – V: Fundamentals of Batteries – Classification of Batteries – types of Batteries - Primary Batteries Le'clanche Dry Cell – Magnesium Dry Cell - Secondary Batteries – Lead Acid Battery – Alkaline Storage -Batteries. Fuel cells(hydrogen- oxygen.

TEXT BOOK:

1. Applied Chemistry and chemical engineering, by A.K.Haghi, Devrim Balkose,Omari

V. Mukbaniani,Apple Academic Press, published on 20.03.2018.

REFERENCE BOOKS:

1. J.C. Kuriacose, J. Rajaram – Chemistry in engineering and Technology – Vol-2 Tata McGraw – Hill Publishing Company Limited – New Delhi – 1979.
2. P.C.Jain & Manika Jain – “Engineering Chemistry” 15th Ed., (2005), Dhanpath Raj publishing company, New Delhi.
3. B.K.Sharma - “Industrial Chemistry”, 1st Ed., (1984), Goel Publishing House – Meerut.
4. P.L.Soni, H.M.Chawla – “Text Book of Organic Chemistry” (1994), Sultan Chand & Sons, New Delhi.
5. Arun Bahl and B.S.Bahl - “Text Book of Organic Chemistry” 11th and 18th Ed., S.Chand, New Delhi.
6. Krishnamoorthy, P.Vallinayagan & K.Jaya Subramanian – “Applied Chemistry”, 2nd Ed., (1999-2001), Tata McGraw – Hill Publishing Co Ltd., New Delhi.

SBC –PROJECT

Hours : 2

Credits : 2

Max.100 Marks(Int: 75 & Ext: 25)

**Soap Making, Waste Water Treatment, Spectrophotometric Studies,
Adsorption**

Group Project Work

5-7 Students for a faculty to guide a project of a single title.

75 Marks for internal performance only.

25 Marks for Viva Voce Only.

NME-FOOD CHEMISTRY

Credit :2

Max Marks (Internal : 100)

UNIT 1 : FOOD ADULTERATION :

Sources of food, types, advantages and disadvantages, Food adulteration –contamination of Wheat, Rice, Alial, Milk, Butter etc. with clay stones, water and toxic chemicals –Common adulterants. Common adulterants Ghee adulterants and their detection. Detection of adulterated Foods by simple analytic techniques. (10hrs Theory + 5hrs Practical).

UNIT 2: FOOD POISON: Food poisons –natural poisons (alkaloids –nephrotoxic) – pesticides, (DDT, BHC, and Malathion) - Chemical poisons and First aid for poison consumed victims. (15hrs).

UNIT 3 : FOOD ADDITIVES : Food additives –artificial sweetners-Saccharin-Cyclamate and aspartate. Food flavours –esters, aldehydes and heterocyclic compound. Food colors –restricted use –spurious colors –Emulsifying agents –preservatives coloring agents. Baking powder yeast – taste makers –MSG vinegar. .

UNIT 4 : BEVERAGES :

Beverages –Soft drinks –soda –fruit juices –alcoholic beverages examples. Carbonation – addiction to alcohol –cirrhosis of liver and social problems.

UNIT 5 EDIBLE OILS :

Fats, Oils –Sources of oils –Production of Refined vegetable oils –Preservation. Saturated and unsaturated fatty acids – I_2 value, saponification values and their significance. Estimation of I_2 and RM values in Edible oils.

Books for Reference :

1. Swaminathan M. Food Science and Experimental foods, Ganesh and Company.
2. Jayashree Ghosh, Fundamental concepts of Applied chemistry, S.Chand & Co., publishers. Thanamma Jacob, Text Books of applied chemistry for Home Science and allied Sciences,

Macmillan.

COURSE OBJECTIVE

- To make the students to have a thorough knowledge about natural resources, ecosystem biodiversity and its conservation
- To understand the environmental pollution.

Unit: I – The multidisciplinary nature of environmental studies

- Definition, scope and importance
- Need for public awareness

Unit: II - Natural resources

- Renewable and non – renewable resources
- Natural resources and associated problems
 - a. Forest resources : Use and over - exploitation, deforestation, timber extraction, mining, dams and their effects on forest and tribal people.
 - b. Water resources : Use and over -utilization of surface and ground water.
 - c. Mineral resources : Use and exploitation, environment effects of extracting and using mineral resources .
 - d. Food resources : World food problems,changes caused by agriculture and overgrazing, fertilizer pesticide problems,
 - e. Energy resources : Growing energy needs, renewable and non renewable energy sources, use of alternate sources.
 - f. Land resources : Land as a resource,Land degradation, and degradation.
- Role of an individual in conservation of natural resources

Unit: III - Eco –system

- Concept of an ecosystem
- Structure and function of an ecosystem
- Producers,consumers and decomposers
- Energy flow in the ecosystem
- Ecological succession
- Food chains, food webs and ecological pyramids

Unit:IV - Biodiversity and its conservation

- Introduction : Definition
- Hotspots of biodiversity
- Threats to biodiversity : habitat loss, poaching of wildlife, man wildlife

conflicts

- Endangered and endemic species of India
- Conservation of biodiversity : In-situ and Ex-situ conservation of

biodiversity .

Unit:V - Environmental pollution

- Definition
- Causes, effect and control measures of
- a).Air pollution
- b).Water pollution
- c).Soil pollution
- d). Noise pollution
- Solid waste management : causes, effect and control measures of urban and industrial wastes

- Role of an individual in prevention of pollution

Unit: VI-Environment

- From unsustainable to sustainable development
- Water conservation, rain water harvesting, watershed management
- Environmental ethics: issues and possible solutions .

Climate change, global warming, acid rain, ozone layer depletion,