The New College (Autonomous) Chennai 600014

B.Sc. DEGREE BRANCH – IV CHEMISTRY

CBCS Pattern SYLLABUS

(Effective from the academic year 2008-2009)

Core-1, SUBJECT – GENERAL CHEMISTRY- I(Semester-I)

Code: BCHM 101 **CREDITS : 4** **TEACHING HOURS: 75**

OBJECTIVES OF THE COURSE:

- To develop in students an intellectual curiosity and a capacity to think in a scientific manner through a comprehensive study of the mechanism of the various types of organic reactions..
- To make the students to feel comfortable and appreciate the chemistry of organic compounds with special emphasis on mechanism.
- The scope of chemistry has occupied every field of day to day life. Hence students can face the challenges with confidence and succeed.

UNIT :I **(15 hours)**

1.1 Atomic structure: Aufbau principle, Hund's rule and electronic configuration of elements- stability of half filled and completely filled orbitals – shapes of s, p, d and f orbitals. S,p,d and f block elements – classification and characteristic properties.

1.2 Periodicity of properties: Definition and periodicity of the following properties – atomic radii, ionic radii, ionization potential, electron affinity and electro negativity (no determination) – lanthanide contraction – inert pair effect and diagonal relationship with example.

UNIT :II **(15 hours)**

2.1 Principles of Volumetric analysis: Definition of molarity, normality, molality, formality and mole fraction. Definition and examples for primary and secondary titrations. Calculations of equivalent weighs, theories of acid base, redox, metalion, absorption indicators and choice of indicators.

2.2 Types of solvents: Protic and aprotic solvents, aqueous and non aqueous solvents, liquid ammonia and liquid SO_2 as solvents.

Unit: III **(10 hours)**

3.1 Basic concepts of bonding in organic chemistry – hybridization and geometry of molecules – methane, ethylene, acetylene and benzene. Electron displacement effects

inductive, inductometric, electrometric, mesomeric, resonance, hyper conjugation and Steric effects: Cleavage of bonds – hemolytic fission of carbon-carbon bond-reaction reaction intermediaries – carbonations. Carboanions and free radicals-their stability.

3.2. Nomenclature of organic compounds, IUPAC recommendations for naming simple aliphatic, alicyclic and aromatic compounds

UNIT :IV **(10 hours)**

4.1 Alkaline – mechanism of free radical substitution in alkanes.

4.2 Alkenes- General methods of preparation, properties of alkenes-electrophilic and free radical addition reactions with hydrogen, halogen, halogens, hydrogen halides (Markownikoff's rule) hydrogen bromide (peroxide effect), sulphuric acid. Water, hydroboration, ozonolysis, hydrolaxation with $KMnO_4$

UNIT : V **(25 hours)**

5.1 Quantum theory: Black body radiation : Planck's theory – photoelectric effect-Compton effect- De-Broglie Relationship-Heisenberg's uncertainty principle-Schrödinger wave equation (no derivation)-significance of wave functions-Probability distribution of electrons-radial Probability distribution curves.

5.2 Gaseous state: – Kinetic Theory of Gasses – Gas laws – Transport properties, viscosity – thermal conductivity – diffusion – Maxwell's distribution of molecular velocities (no derivation) – mean, RMS, most probable velocities – Equipartition of energy-Heat capacity, molecular basis-Virial equation of state-Boyle's Temperature. Coefficient of compressibility and thermal expansion

5.3 Solid state: Elements of symmetry- crystal system – Miller indices – unit cell space lattice - Bravais lattice, Bragg's equation & its derivation, packing fraction, X-ray diffraction method, powder method, rotating crystal method.

5.4 Mesomorphic state: Liquid crystal-classification and molecular rearrangements.

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CORE.2, PRACTICAL –I VOULMETRIC ESTIMATION (SEMESTER-I)

Code: BCHMP 11 **CREDITS : 2** **TEACHING HOURS: 30**

OBJECTIVES OF THE COURSE

To devolope the skill to perform titrations technically and impart the knowledge of estimation of given solution volumetrically.

1. Acidimetry :

1. Estimation of sodium hydroxide using standard carbonate.

2. Permanganometry

Estimation of oxalic acid using Mohr' salt or ferrous sulphate

3. Iodometry :

Estimation of copper using standard potassium dichromate

4. Complexometry

Estimation of zinc or magnesium using EDTA.

5. **Dichrometry:**

Estimation of ferrous ion using external indicator.

Reference Books:

1. Practical chemistry-A.O.Thomas(Scientific book centre, Cannanore).

2. Vogel's Text book of chemical analysis.

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Core-3, SUBJECT – GENERAL CHEMISTRY- II (Semester-II)

Code: BCHM 202 **CREDITS : 04** **TEACHING HOURS: 75**

OBJECTIVES OF THE COURSE:

- To aquint the students with concepts of chemical bonding and applications of VSEPR and MO theories.
- To provide sound knowledge on chemistry of Hydrides and S – block elements.
- To provide them knowledge on chemistry of alkynes, dienes, cyclo alkanes and polymerization principles.
- To enable them sound in science of thermodynamics.

Unit: I: **(15 hours)**

1.1 Ionic bond**:** Formation and general properties. Radius ration rule and its limitations Hydration energy and lattice energy and their applications. Born-Haber cycle and Fajan's rule.

1.2 Covalent bond: Valence bond theory. Formation and general properties. Orbital overlap – Hybridization, sigma and pi bonds. VSEPR theory and geometrics of H_2O, NH_3, CH_4, PCl_5, PCl_3 BF_3, SF_6, IF_7 and SO_2 molecules. Partial ionic character of covalent bond and percentage of ionic character.

Unit: II **(15 hours)**

2.1 Molecular Orbital theory: Bonding and antibonding orbitals and bond order. MO diagrams of H_2, Be_2, O_2, O_2^+, O_2^-, CO and NO. Comparison of VB and MO theories. Hydrogen bonding – types, examples and effect on properties.

2.2 Hydrides **–** classification and chemistry**.**

2.3 Alkali metals: Occurrence, comparative study of elements, oxides, halides, hydroxides, sulphates and carbonates. Exceptional property of Lithium

2.4 Alkali earth metals: Occurrence, comparative study of elements, oxides, halides, hydroxides, sulphates and carbonates. Exceptional property of Beryllium.

Unit: III: **(15 hours)**

3.1 Alkynes – Preparation and properties, acidity of alkynes, formation of acetylides Addition of water with $HgSO_4$ catalyst, addition of hydrogen halides and halogens, oxidation, ozonolysis and hydrocarboration

3. 2 Dienes- Classification – conjugated, isolated and cumulative dienes. Stability and chemical reactivity- 1,2 and 1,4 additions. Diels-alder reaction. Synthesis of dienes – 1,3 – butadiene, isoprene and chloroprene.

3.3 Polymerization – Types of polymerization – free radical cationic and anionic Polymerization including mechanism of preparation of polymers – addition polymers Condensation polymers with examples.

Unit: IV: **(15 hours)**

4.1 Definition and explanation of terms – intensive and extensive properties – types of systems – thermodynamic process – cyclic, reversible, irreversible, isothermal and adiabatic.

4.2 Thermodynamic functions – complete differential – Zeroth law of thermodynamic – concept of heat and work.

Unit: V **(15 hours)**

5**.1** First Law of thermodynamics – statement and equation. Cp and Cr relationship – calculation of W, E and H for the expansion of ideal gases under reversible, isothermal and adiabatic conditions**.**

5.2 Joule's law – joule – Thompson effect – inversion temperature and its significance.

5.3 Thermo chemistry: Bond energy – Bond disassociation energy – Calculation from . thermo chemical data – variation of heat of reaction with temperature – Kirchoff's equation.

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CORE.4, PRACTICAL –INORGANIC QUALITATIVE ANALYSIS (SEMESTER –II)

Code: BCHMP 22 CREDITS : 2 TEACHING HOURS: 30

OBJECTIVES OF THE COURSE

To devolope the skill For observation during analysis of salt and ability to interpret the collected data in the identification of the radicals.

Analysis of a mixture containing two cations two anions, one of which will be

an interfering ion.Semimicro methods using the conventional scheme may be adopted.

Anions:

Carbonates, sulphides, sulphates, fluorides, chlorides, bromide, nitrate, oxalate, phosphate, and borate.

Cations:

Lead, silver, mercury, copper, tin, antimony, cadmium, bismuth, aluminum, chromium, iron, manganese, zinc, cobalt, nickel, calcium, strontium, barium, magnesium, ammonium.

Reference Books:

1. Practical chemistry-A.O.Thomas(Scientific book centre, Cannanore).
2. Vogel's Text book of chemical analysis.

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Core-5, GENERAL CHEMISTRY-III (Semester-III)

Code: BCHM 303 **Teaching Hours: 75** **Credits: 4**

Unit-I **(15 Hours)**

1.1 Principles of Inorganic Analysis - Principles of common ion effect and solubility product and their applications in qualitative analysis. Spot test reagents - aluminon, cupferon, thiourea, magneson, and alizarin - Semi micro techniques.

1.2 'p' block elements - Boron family - electron deficiency and electron acceptor behavior - bonding in diborane. Preparation, properties, uses and structure of borazole, $NaBH_4$, and $LiAlH_4$.

Unit-II **(15 Hours)**

2.1 Carbon family - Comparison of properties of carbon and silicon valencies, oxides, halides, hydrides and oxyacids classification, properties and uses of carbides. Classification of silicates.

Unit-III **(15 Hours)**

3.1 Aromatic hydrocarbons and aromaticity - resonance in benzene - delocalized cloud in benzene - Huckel's rule (4n+2) system and its simple applications. Electrophilic substitution reactions in aromatic compounds. General mechanisms- nitration, halogenations, sulphonation, Friedal-Craft's alkylation and acylation -directive influence - orientation, nuclear and side chain halogenations.

Unit-IV **(15 Hours)**

4.1 Polynuclear hydrocarbons - naphthalene, and anthracene and phenanthracene-isolation, properties, synthesis and uses.

4.2 Aliphatic Nucleophilic substitution, mechanism of SN_1, SN_2 and SN_i reactions - effects of structure, substrate, solvent, nucleophile and leaving groups.

Unit-V **(15 Hours)**

5.1 Second law of thermodynamics - need for second law, statement of second law. Spontaneous process, carnot cycle – efficiency - carnot's theorem (statement only).

5.2 Concept of entropy – definition - entropy of an ideal gas - entropy changes in cyclic, reversible and irreversible processes and physical transformations. Calculation of entropy changes with changes in temperature, pressure and volume – entropy of mixing.

5.3 Gibbs free energy - Helmotz free energy-their variations with temperature, pressure and volume. Criteria for spontaneity - Gibbs-Helmoltz equations -derivation and applications.

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Core-6 PHYSICAL CHEMISTRY PRACTICAL-I (Semester III)

Code: BCHMP 33 **Teaching Hours: 45 Hours** **Credits: 3**

1. Distribution Law.
   (a) Determination of partition coefficient of iodine between carbon tetrachloride and water.
   (b) * Degree of association of benzoic acid between water and benzene
   (c) Equilibrium constant of the reaction $KI + I_2 = KI_3$
2. Determination of the order of the following reactions.
   (a) Acid catalyzed hydrolysis of an ester (methyl or ethyl acetate)
   (b) Saponification of an ester (methyl or ethyl acetate)
   (c) Iodination of acetone
3. Molecular weight of a solute-Rast's method using naphthalene, m-dinitrobenzene and diphenyl as solvents.
4. Heterogeneous equilibria:
   (a) Phenol-water system – CST
   (b) Effect of Impurity- 2% NaCl or succinic acid solutions on phenol-determination of the concentration of the given solution.
   (c) Determination of transition temperature of the given salt hydrate. $Na_2S_2O_3$. $5H_2O$, CH_3COONa. $3H_2O$,, $SrCl_2$ $6H_2O$, , $MnCl_2$ $4H_2O$.

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Core-7 GENERAL CHEMISTRY-IV (Semester-IV)

Code: BCHM 404 **Teaching Hours: 75 Hours** **Credits: 4**

Unit-I **(15 Hours)**

1.1 Nitrogen family

Comparative study of N, P, As, Sb, and Bi – elements, oxides, oxyacids, halides and anhydrides, valency states – preparation, properties, structure and uses of hydrazine, hydroxylamine and hydrazoic acids, preparation and uses of $NaBiO_3$.

1.2 Oxygen family

Comparative study of O, S, Se, and Te – elements, hydrides, oxides and oxyacids of sulphur including peroxy acids.

Unit-II **(15 Hours)**

2.1 Halogens

Comparative study of F, Cl, Br, I and At – elements reactivities, hydrogen halides, oxides and oxyacids. Interhalogen compounds and pseudo halogens. Exceptional properties of Fluorine.

2.2 Nobel Gases

Electronic configuration and position in the periodic table. Applications, clathrates and compounds of xenon, hybridization and geometries of XeF_2, XeF_4, $XeOF_4$.

Unit-III **(15 Hours)**

3.1 Elimination Reactions

Hoffmann and Saytzeff's rules – cis and trans eliminations – mechanisms of E_1 and E_2 reactions. Elimination vs. substitution.

3.2 Alcohols

Synthesis by Grignard method and oxymercuration – chemical reactivity. Polyhydric alcohols, cleavage reactions with periodic acid, lead tetra acetate, osmium tetra oxide. Unsaturated alcohols – preparation and reactions of allyl alcohol.

Unit-IV Phenols **(15 Hours)**

4.1 Acidic character of phenols – explanation on the basis of resonance stabilization. Ring substitution in phenol – orientation of phenolic group towards electrophiles. Mechanisms of electrophilic substitution reactions - alkylation, acylation, nitration, sulphonation, halogenation, coupling with diazonium salts. Kolbe's reaction, Reimer-Tiemann reaction, Gattermann reaction. Dihydric phenols (catechol, quinol, and resorcinol), trihydric phenols (pyrogallol and phloroglucinol), alpha and beta napthols – preparation and properties.

Unit-V **(15 Hours)**

5.1 Third law of Thermodynamics

Nernst heat theorem-statement of Third law of thermodynamics. Evaluation of absolute entropy from heat capacity measurements. Exception to Third law.

5.2 Partial Molar Properties

Chemical potential – Gibbs Duhem equation – effect of temperature and pressure on chemical potential – chemical potential in system of ideal gases – Duhem-Margules equation.

5.3 Chemical Equilibrium

Derivation of the law of chemical equilibrium – reaction isotherm – relationship between equilibrium constant and free energy – variation of equilibrium constant with temperature – Vant Hoff isochore.

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(Effective from 2008-2009)

CORE, 8, PHYSICAL CHEMISTRY PRACTICAL-II (Semester IV)

Code: BCHMP 44 **Teaching Hours: 45 Hours** **Credits: 3**

Electrochemistry

Conduct metric titrations

a. Determination of cell constant and equivalent conductivities of solutions of two different concentrations.
b. Conduct metric titrations of strong acid against strong base.
c. Conduct metric titrations of weak acid against strong base.
d. Verification of Onsager equation.
e. Verification of Debye-Huckel Limiting law.
f. Dissociation constant of Acetic acid.
g. Dissociation constant of Formic acid.

Potentiometric titrations

a. Potentiometric titrations of strong acid against strong base.
b. Potentiometric titrations of weak acid against strong base.
c. Potentiometric titrations involving precipitation reactions.

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CBCS Pattern SYLLABUS Semester V

(Effective from the academic year 2008-2009)

CORE: 9 SUBJECT – INORGANIC CHEMISTRY -I (SEMESTER –V)

CODE: BCHM 505 **Credits: 5** TEACHING HOURS 75

OBJECTIVES OF THE COURSE:

- To enable the students to understand the basic principles in Nuclear Chemistry.
- To provide the significance of chemistry off-block elements.
- To provide basic understanding in chemistry of metallurgy and industrial applications.

Unit-I: Nuclear Chemistry **15 Hours**

1.1 Radioactive series including Neptunium series-group displacement law. Fundamental particles of the nucleus- nucleon terminology, nuclides, isotopes, isobars, isotones, mirror nuclei. Nuclear radius, nuclear mass and nuclear forces operating between the nucleons. N/P ratio, curves, stability belts – Radioactivity Grauthers draper law – Radioactive series.

1.2 Nuclear binding energy. Mass defect, simple calculations involving mass defect and B.E per nucleon, Magic numbers – Liquid drop model- shell model.

Unit-II: Artificial Radioactivity **15 Hours**

2.1 Definition – Induced radioactivity-uses of radio isotopes. Nuclear fission-nuclear energy-nuclear reactors-breeder reactors-nuclear fusion – thermonuclear reactions-energy source of the sun and stars.

Unit-III: Chemistry of `f' block elements **15 Hours**

3.1 Comparative account of – Lanthanides and actinides- occurrence, elements, oxidation states, magnetic properties, color and spectra.

Unit-IV: Metallurgy **15 Hours**

4.1 Metallurgy and metallurgical processes, zone refining, Van arkel process, electrolytic refining extraction, alloys and uses of Pt, Th and U. Uranium hexafluoride and its importance. Steel alloys – heat treatment of steel.

Unit-V: Industrial Chemistry **15 Hours**

5.1 Fuel Gases, Calorific value-composition and source of water gas, semi water gas, carbonated water gas, producer gas, oil gas, LPG and bio-gas. (Manufacture not required)

5.2 Water: Hardness of water, Types of hard water – Softening of water using washing soda, ion exchange resins and boiling methods.

5.3 Cement: Composition and setting of cement

5.4 Paints and Pigments: Examples and their role.

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CBCS Pattern SYLLABUS Semester V

(Effective from the academic year 2008-2009)

CORE : 10 SUBJECT – ORGANIC CHEMISTRY- I(SEMESTER –V)

CODE: BCHM 506 **Credits: 5** TEACHING HOURS 75

OBJECTIVES OF THE COURSE:

- To enable the students to think and appreciate in a scientific a scientific manner through a comprehensive study of mechanisms of the various types of organic reactions.
- To enable the students to understand and appreciate the concepts of stereochemistry.

Unit - I: **15 Hours**

1.1 Carbonyl polarization, Reactivity of carbonyl group - acidity of hydrogen.

1.2 Mechanisms of Aldol, Perkin, Knoevenagel, Benzoin, Dieckmann, Stobbe condensations, Claisen, Wittig, Cannizzaro, Reformat sky, Halo form and Mannich reaction.

1.3 Mechanisms of Clemmensen, Wolf-Kishner, MPV, Rosenmund

1.4 Mechanisms of oxidation of aldehydes and ketones by $KMnO_4$ and Baeyer - Villiger oxidation.

Unit - II: **15 Hours**

2.1 Ionization of carboxylic acids - acidity constants - comparison of acid strengths of mono, di and unsaturated acids - acid strengths of substituted benzoic acids.

2.2 Preparation and properties of mono carboxylic acids - HVZ, esterification. decarboxylation, kolbe's electrolysis, Hunsdieker reaction, Arndt - Eistert homologation.

2.3 Preparation and properties of dicarboxylic acids - uses of NBS as an oxidizing agent.

2.4 Preparation and properties of salicylic and phthalic acids - Kolbe- Schmidt reaction and Dakin reaction.

2.5 Active methylene compounds: Malonic and acetoacetic ester – synthetic uses of malonic and acetoacetic ester.

Unit-III: **15 Hours**

3.1 Stereoisomerism: Definition – classification into optical and geometrical isomerism.

3.2 Optical isomerism – optical activity – conditions for optical activity – asymmetric center – chirality – methods of racemisation and resolution – asymmetric synthesis – (partial and absolute) – Walden inversion.

3.3 Absolute configuration: Cahn – Ingold – Prelog rules, R-S notations for optical isomers with one and two asymmetric carbon atoms.

3.4 Geometrical isomerism: Cis, trans and E,Z notations – geometrical isomerism in maleic and fumaric acids – physical and chemical methods of distinguishing geometrical isomers.

3.5 Conformational analysis: Conformers – dihedral angle – conformational analysis of ethane and n-butane – energy diagram – conformers of cyclohexane – boat and chair forms.

Unit-IV: **15 Hours**

4.1 Aromaticity of heterocyclic compounds.

4.2 Preparation, properties and uses of furan, pyrrole and thiophene.

4.3 Synthesis and reactions of pyridine – comparative study of basicity of pyrrole, pyridine and piperidine with amines.

4.4 Synthesis and reactions of quinoline, isoquinoline and indole with special reference to Skraup. Bischler-Napieralskii and Fischer indole syntheses.

Unit-V: **15 Hours**

5.1 Nitro compounds & amines – Conversion of nitro benzene into ortho, para and meta dinitrobenzene & TNT. Aromatic nitro compounds: reduction in neutral, acidic and alkaline media. Relative basic strengths of aliphatic and aromatic amines. Diazotisation and its mechanism. Synthetic applications of diazonium salts.

5.2 Photochemistry of carbonyl compounds: Norrish type I and type II reactions and Barton reaction.

5.3 Tautomerism: Definition – keto – enol & nitro – acinitro tautomerism – Identification, separation and mechanism.

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(Effective from the academic year 2008-2009)

CORE : 11 SUBJECT – PHYSICAL CHEMISTRY- I

CODE: BCHM 507 **Credits: 4** TEACHING HOURS 75

OBJECTIVES OF THE COURSE:

To understand the behaviour of solutions, phase equilibria.

- Adsorption phenomena, catalysis and theories.
- Caters to perform purification separation techniques.
- Helps to learn rate of exothermic and endothermic reaction and theories of reaction rate.

Unit-I: **15 Hours**

1.1 Solutions: Solutions of gases in liquids – Henry's law, Solution of liquids in liquids. Raoult's law, Binary liquid mixtures – Ideal solutions – deviations from ideal behaviour – vapour pressure – Composition and vapour pressure – temperature curves, azeotropic distillation.

1.2 Clapeyron – Clausius equation: Derivation and uses, thermodynamic derivation of elevation of boiling point and depression of freezing point, calculation of molecular weights.

1.3 Distribution law – Thermodynamic derivation and applications:

Unit-II: **15 Hours**

2.1 Phase equilibria: Gibb's phase rule – statement and definition of terms – Application to one-component systems – water and sulphur, reduced phase rule – two component systems simple electric system (lead – silver system), freezing mixtures. Two component systems – compound formation with congruent melting point (Zinc – Magnesium system, Ferric chloride – water system), incongruent melting point (sodium – potassium system), Partially miscible liquids – Phenol – water, CST and effect of impurities on CST.

Unit-III: **15 Hours**

3.1. Chemical Kinetics: - Definition of order and molecularity – methods to determine the rate of reactions, derivation of rate constants for I, II. order reactions - Third and zero order reactions and examples. (No derivation of rate constant) Derivation for time for half change with examples, methods to determine the order of reactions – effect of temperature on the rate of reactions.-Arrhenius equation and concept of energy of activation.

Unit-IV: **15 Hours**

4.1. Collision theory: Collision theory and derivation of rate constant for bimolecular reactions – theory of absolute reaction rates – thermodynamic derivation for the rate constant for a biomolecular reaction from it – Absolute Reactions Rate Theory (ARRT) Comparison of collision and ARRT. Significance of entropy and free energy of activation – Consecutive, parallel and reversible reactions. (No derivations, only examples)

Unit-V: **15 Hours**

5.1 Adsorption: Physisorption and chemisorption – Freundich adsorption isotherm – Langmuir adsorption isotherm – BET equation (noderivation) – applications of adsorption.

5.2 Catalysis: Definition – homogeneous catalysis – function of a catalyst in terms of Gibb's free energy of activation, heterogeneous catalysis.

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(Effective from the academic year 2008-2009)

CORE : 12 ,SUBJECT – ANALYTICAL CHEMISTRY -I

CODE: BCHM 508 **Credits: 4** TEACHING HOURS 75

OBJECTIVES OF THE COURSE:

To give an insight to the key concepts of analytical chemistry with special reference to practical courses.

- To enable the students to grasp the basics of thermo analytical methods & chromatographic techniques and to gain a clear picture of the principles and processes which underline the subject.
- To provide fundamental knowledge on principles, instrumentation & applications of UV – Visible, Infrared and Raman spectroscopy.

Unit I: **15 Hours**

1.1.Data analysis – idea of significant figures and its importance with examples- precision and accuracy – method of expressing accuracy – error analysis- minimizing errors – method of expressing precision – average deviation – standard deviation and confidence limit.

1.2.Principles of gravimetric analysis – characteristics of precipitating agents – choice of precipitants and conditions of precipitation. Specific and selective precipitants – DMG, cupferron, salicylaldehydeoxime – use of sequestering agents – Co-precipitation – Post- precipitation – differences – reduction of error – Precipitation from homogeneous solutions.

Unit II: **15 Hours**

2.1. Thermo analytical methods – principle involved in thermo gravimetric analysis and differential thermal analysis – discussion of various components with block diagram – characteristics of TGA and DTA – factors affecting TGA and DTA curves – thermometric titrations.

2.1.Separation and purification techniques: Solvent extraction – soxhlet extraction- recrystallisation – fractional crystallization – sublimation. Experimental techniques of distillation – fractional distillation – vacuum distillation – steam distillation.

Unit III: **15 Hours**

3.1. Chromatography techniques – principles of adsorption, partition and ion exchange chromatography. Column chromatography – adsorbents – preparation of column – elution and applications. TLC – choice of adsorbent and solvent – preparation of chromatogram and applications – Rf value. Paper chromatography – principle, Rf value, separation of aminoacid mixtures. Ion exchange chromatography – resins – action of resins – experimental technique – applications – separation of Zn-Mg, Co-Ni, Cd-Zn, Cl-Br. Gas chromatography and high performance liquid chromatography – principles and applications only.

Unit IV: **15 Hours**

4.1. Introduction to absorption spectroscopy – Electromagnetic spectrum, its regions. Line and Band spectra. UV – Visible spectroscopy – instrumentation – spectrophometer – block diagrams with description of components – theory – types of electronic transitions – Chromophore and auxochromes. Shift of absorption bands (Blue, red shift, Hyperchromic and Hypochromic effects.). Absorption maximum (λ max) – calculation of λ max for a few aromatic compounds. (ArCOG; G=H, R, OH, OR)

Unit V: **15 Hours**

5.1. Infrared spectroscopy – principle – types of stretching and bending vibrations – vibrational frequencies – instrumentation of single beam spectrometer only – block diagram – source – monochromator – cell sampling techniques – detector and recorders – identification of organic molecules from characteristic absorption bands (carbonyl compounds, carboxylic acids, phenols and nitro compounds only)

5.2 Raman spectroscopy – Raleigh and Raman scattering – Stoke's and anti stokes lines – instrumentation – block diagram – differences between LR and Raman Spectroscopy – mutual exclusion principle (definition only) – applications – structural diagnosis.

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(Effective from the academic year 2008-2009)

Elective 1 SUBJECT- APPLIED CHEMISTRY I

CODE: BCHM 509 **Credits: 4** TEACHING HOURS 75

OBJECTIVES OF THE COURSE:

- To make the students understand the basics of pharmaceutics and classification of drugs, diseases and their remedies.
- To enable the students understand the simple biological processes and role of enzymes and hormones in these processes.

Unit I: Pharmaceutical chemistry – I **15 Hours**

1.1 Definition of the following terms – drug, pharmocophore, pharmacology, pharmacopeia, pharmacodynamics, bacteria, virus and vaccine.

1.2 Causes, symptoms and drugs for anaemia, jaundice, cholera, malaria and filarial

1.3 Indian medicinal plants and uses – tulasi, neem, kizhanelli, mango, semparuthi, adadodai and thoothuvalai.

1.4 Blood-grouping, composition, Rh-factor, blood - pressure, hypertension and hypotension.

Unit II: Pharmaceutical chemistry – II **15 Hours**

2.1 Antibiotics – definition and action of Penicillin, Streptomycin, Ehloramphenicon, Crythromycin – Tetracyclines, SAR of Chloramphenical only.

2.2 Antiiseptics and disinfectants – definition and distinction – phenolic compounds, chloro compounds, cationic surface active agents.

2.3 Analgesis – Definition and actions – narcotic and non narcotic – morphine and its derivatives, pethidine and methadone – disadvantages and uses.

Unit III: Pharmaceutical chemistry – III **15 Hours**

3.1 Anaesthetics – Definition – local and general – volatile – nitrous oxide, ether, chloroform, cyclopropane – uses and disadvantages – non volatile – intravenous – thiopental sodium, methohexitone, propanidid.

3.2 Drugs affecting CNS – Definition, distinction and examples for – tranqualizers, sedatives, hypnotics – psychedelic drugs – LSD, hashish – their effects.

3.3 Causes, medicines and their mode of action for the treatment of – cancer, antineoplastics – diabetics – hypoglycemic agents. AIDS – AZT, DDC.

Unit IV: Pharmaceutical chemistry – IV **15 Hours**

4.1 Antibacterials – sulpha drugs – examples and actions – prontosil, sulphathiazole and sulphafurazole.

4.2 Antipyretics and anti inflammatory agents – salicylic derivatives, paracetamol and ibuprofen.

4.3 Cardio vascular drugs – cardiac glycosides, Antiarrhythemic drugs, Antihypertension drugs, Antianginal agents, Vasodilators.

Unit V: Biological Chemistry **15 Hours**

5.1 Elementary treatment of digestion and absorption of carbohydrates, proteins and fats.

5.2 Elementary treatment of enzymes, coenzymes, cofactors, prosthetic groups and theory of enzyme action.

5.3 Physiological functions of adrenalin, thyroxin, oxytocin, insulin and sex hormones.

5.4 Micronutrients and their biological role in human systems.

CBCS Pattern

SYLLABUS FOR

III B.Sc. Chemistry (2008 – 2009 Batch)

VI SEMESTER

THE NEW COLLEGE (AUTONOMOUS), CHENNAI – 14

B.Sc. DEGREE: BRANCH – IV CHEMISTRY

CBCS Pattern SYLLABUS Semester VI

(Effective from the academic year 2008-2009)

CORE : 13 SUBJECT – INORGANIC CHEMISTRY II

CODE: BCHM 610 **Credits: 4** TEACHING HOURS 75

OBJECTIVES OF THE COURSE:

- To provide the significance of chemistry of d-block elements.
- To provide thorough knowledge in fundamentals of Coordination chemistry, Crystal field theory.
- To provide the biological significance of essential and some non essential elements.
- To enable the students to understand the basic chemistry behind various types of pollution.

Unit-I: Chemistry of `d' block elements **15 Hours**

1.1 Characteristics of `d' block elements. Comparative study of Ti, V, Cr, Mn and Iron group metals- occurrence, oxidation states, magnetic properties, catalytic properties and color.

1.2 Theory of Bonding, Valence bond theory – hybridization, geometry and magnetic properties. Failure of VBT.

Unit-II: Coordination compounds **15 Hours**

2.1 Nomenclature, Werner's theory, EAN rule, Coordination number and geometry. Chelation and effect of chelation. Application of EDTA. Ionisation isomerism, hydrate isomerism, Linkage isomerism, Ligand isomerism, Coordinated isomerism, polymerization isomerism. Geometrical and optical isomerism in 4 and 6 coordinated complexes.

Unit-III: Crystal Field Theory **15 Hours**

3.1 Crystal field theory-Spectrochemical series, splitting of `d' orbital in Octahedral, tetrahedral and square planar complexes- low spin and high spin compleces- Explanation of magnetic properties, color and geometry using CFT. Trans effect and its explanation.

3.2 Comparison of VBT and CFT.

Unit-IV: Bio inorganic chemistry **15 Hours**

4.1 Elementary aspects of Haemoglobin, myoglobin, Chlorophyll and Vitamin 13 – 12.

4.2 Pi acceptor Ligands- Bonding, hybridization and structures of carbonyls of Ni, Cr, Fe, Co, Mn, W and V.

Unit-V: Pollution and its control **15 Hours**

5.1 Sources of air pollution CO_2 Pb, CO, Oxides of nitrogen and sulphur, freons, smog-green house effect-global warming – methods of control.

5.2 Pollution of soil- fertilizers, insecticides, solid waste and acid rain. Methods of control.

5.3 Water Pollution – Industrial and domestic waste, effluents, sewage waste, fertilizers, insecticides oil, toxic metals. COD and BOD. Consequences- methods to control water pollution. Rain water harvesting –its need, methods and advantages.

5.4 Noise pollution and radioactive pollution – health hazards.

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(Effective from the academic year 2008-2009)

CORE : 14 SUBJECT – ORGANIC CHEMISTRY II

CODE: BCHM 611 **Credits: 4** TEACHING HOURS 75

OBJECTIVES OF THE COURSE:

- To study about various organic compounds of industrial importance.
- To study and appreciate the nature of basic building blocks, chemistry of carbohydrates and natural products.
- To provide an understanding of mechanisms involved in various organic rearrangements.

Unit I: **15 Hours**

1.1 Preparation of phenylene diamines, sulphanilic acid, sulphanilamide, saccharin and chloramines – T.

1.2 Dyes – theory of colour and constitution. Classification – according to structure and methods of application. Preparation and use of 1) Azo dye – methyl orange and Bismark brown 2. Triphenyl methane dye-malachite green 3. Phthalein dye – phenolphthalein and fluroescein 4. Vat dye – indigo 5. Anthraquinone dye – alizarin.

Unit II: **15 Hours**

2.1 Amino acids and proteins – classification of amino acids. Essential and non-essential amino acids. Preparation of α-amino acids, properties and reactions. Zwitter ions, isoelectric points – Peptide synthesis – structure of polypeptides – end group analysis.

2.2 Proteins – Classification based on physical and chemical properties and on physiological functions. Primary and secondary structures of proteins. α – helical structure (elementary treatment only). Denaturation of proteins.

Unit III: **15 Hours**

3.1 Carbohydrates – Classification – Constitution of glucose and fructose. Reactions of glucose and fructose – osazone formation. Mutarotation and its mechanism. Cyclic structure. Pyranose and furanose forms. Determination of ring size. Haworth projection formula. D and L configuration of monosaccharides – epimerisation, chain lengthening and chain shortening of aldoses. Inter conversion of aldoses and ketoses.

3.2 Disaccharides: Structure of sucrose & maltose. Polysaccharides: Properties of Starch & Cellulose (Structural elucidation not required). Uses of cellulose derivatives.

Unit IV: **15 Hours**

4.1 Natural products – Terpenes – isoprene rule. Classification of Terpenes. Structural elucidations of Citral, menthol and α- terpineol.

4.2 Alkaloids – General methods of isolation and general methods of structure determination – structural elucidation of coniine, piperine and nicotine.

Unit V: **15 Hours**

5.1 Diazomethane and diazoacetic ester – preparation, structure and synthetic uses.

5.2 Nucleic acids – types of nucleic acids – RNA and DNA – components – Types of RNA and their biological functions.

5.3 Molecular rearrangements: Pinacol – Pinacolone,, Wagner Meerwein, Wolff, Beckmann, Hofmann, Benzilic acid, Cope and Claisen rearrangements.

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CBCS Pattern SYLLABUS Semester VI

(Effective from the academic year 2008-2009)

CORE : 15 SUBJECT – PHYSICAL CHEMISTRY II

CODE: BCHM 612 **Credits: 4** TEACHING HOURS 75

OBJECTIVES OF THE COURSE:

- To understand the basics of Photochemistry, symmetry operations, conductors, conductance, Buffer, electrolytes, electrodes, cells and applications.
- Learns to write point group for molecules.
- Able to find conductance, able to prepare buffers of different pHs'
- Learns to find potential of an unknown single electrode, emf of an unknown cell and pH of solutions.
- Learns to construct a battery and fuel cell.

Unit I: Photochemistry and Group Theory **15 Hours**

1.1 Photochemistry: Laws of Photochemistry: Grothus – Draper`s law – Stark – Einstein`s llaws & photochemical equivalence, Beer – Lamberts law and Quantum yield. Primary and Secondary reactions – kinetics of hydrogen and bromine reaction – Fluorescence and phosphorescence – Photosensitisation – Chemiluminescence.

1.2 Group theory: Symmetry operations – products of symmetry operations – classes and subgroups – group multiplication table – Properties of a group – point groups – C_2v, C_3v (any one example for each).

Unit II: **15 Hours**

2.1 Metallic and Electrolytic Conductors: Specific, equivalent and molar conductance-measurement of conductance – variation of conductance with dilution for strong and weak electrolytes (qualitative explanation), Transport number and its determination by Hittorff's and moving boundary method, effect of temperature and concentration. Ionic mobility and ionic conductance, Kohlrausch's law and its applications, salt hydrolysis and pH of a salt solution, buffer action and explanation.

Unit III: **15 Hours**

3.1 Theory of strong electrolytes – Debye – Huckel theory – Verification of Onsager equation – Wein effect and Debye – Falkenhargen effect, ionic strength, activity and activity coefficients of strong electrolytes.

3.2 Applications of conductivity measurements – degree of hydrolysis, solubility product and conductometric titrations.

Unit IV: **15 Hours**

4.1 Galvanic Cells – reversible and irreversible electrodes and cells, standard cell – emf and its measurements – types of electrodes – electrode reactions – electrode potentials – reference electrodes – standard electrode potentials.

4.2 Derivation of Nernst equation for electrode potential and cell emf, sign conventions electrochemical series and its applications, formation of cells – electrode and cell reactions, cell emf – chemical cells and concentration cells with and without transference – examples and derivation of expressions for their emfs – liquid junction potential.

Unit V: **15 Hours**

5.1 Applications of emf measurements – Calculation of ΔG, ΔH, ΔS and equilibrium constants – determination of pH using quinhydrone and glass electrodes, potentiometric titrations.

5.2 Applications of concentration cells – determination of valency of ions, transport number, equilibrium constant, solubility product, activity coefficients of electrolytes.

5.3 Polarisation – decomposition potential, over voltage cells, lead acid battery – mechanism of discharging and recharging, fuel cells.

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CBCS Pattern SYLLABUS Semester VI

(Effective from the academic year 2008-2009)

Elective 2 SUBJECT – ANALYTICAL CHEMISTRY II

CODE: BCHM 613 **Credits: 4** TEACHING HOURS 75

OBJECTIVES OF THE COURSE:

- To provide a basic knowledge about principles, instrumentation and applications of polarography, amperometry and polarimetry.
- To give a wider knowledge of the various aspects of spectroscopy and their interpretation in structural elucidation.
- To provide fundamental computer literacy and its applications in chemistry.

Unit I: **15 Hours**

1.1 Polarography – principle – dropping mercury electrode – advantages and disadvantages – migration and diffusion currents – Ilkovic equation (derivation not required) and significance – electrodes – current voltage curve – oxygen curve – polarography as an analytical tool in quantitative and qualitative analysis. Amperometry – basic principles and advantages. Types of amperometric curves.

1.2 Polarimetry – principle – instrumentation – comparison of strengths of acids – estimation of glucose.

Unit II: **15 Hours**

2.1 NMR spectroscopy – principle of nuclear magnetic resonance – basic instrumentation – shielding mechanism – chemical shift – number of signals – spin coupling and coupling constants – splitting of signals – NMR spectrum of simple organic compounds (prediction of NMR signals and peaks only).

Unit III: **15 Hours**

3.1 Mass spectrometry – Basic principles – Instrumentation (single focusing mass spectrometer) – molecular ion peak, and base peak – Isotopic peaks (C^{13}, N^{13}, O^{18} only), metastable peak. Nitrogen rule – determination of molecular formulae with examples. Mass spectrum of simple organic compounds – identification – alcohols, aldehydes, aromatic hydrocarbons only – MaLafferty rearrangement

Unit IV: **15 Hours**

4.1 Introduction to computers: Definition – characteristics of computers – History of computers - Generation of computers. Brief account on Hardware and software.

4.2 Details on hardware components – system organization – IPO cycle – Data and information. Operating systems and its classes. Memory units and number system.

Unit V: **15 Hours**

5.1 Introduction to problem solving techniques. Algorithm – flow charts –programmes. Introduction to software languages – significance of BASIC, FORTRAN, COBOL, and C languages.

5.2 Elements of BASIC language – constants, variables, operators, control statements, loops and arrays.

5.3 Programming in BASIC to calculate pH of a solution, molarity, normality and molality.

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(Effective from the academic year 2008-2009)

Elective 3 SUBJECT – APPLIED CHEMISTRY II

CODE: BCHM 614 **Credits: 4** TEACHING HOURS 75

OBJECTIVES OF THE COURSE:

- To impart fundamental knowledge and mechanism of polymerization
- To understand the chemistry of industrially important polymers.
- To enable the students appreciate the importance of chemistry of agriculture dairy and leather products and their processes.

Unit I: Diary chemistry **15 Hours**

1.1 Milk Definition, general composition, physicochemical changes taking place in milk due to boiling, pasteurization, sterilization and homogenization – explanation.

1.2 Components of milk – lipids, proteins, carbohydrates, vitamins, ash and mineral matters- names and functions.

1.3 Definition and composition of cream, butter, ghee, ice cream, stabilizer and emulsifier.

1.4 Milk powder, definition and need for making – manufacturer of whole milk powder spray drying process.

Unit II: Polymer chemistry **15 Hours**

2.1 Polymer – Definition and classification.

2.2 Natural polymers – rubber, cellulose, starch, wool, silk – starting materials and uses.

2.3 Synthetic polymers – polyalkenes, acrylics, polyamides, polyesters, PVC, polyurethane- starting materials and uses.

2.4 Numbers average and weight average molecular weight of polymers – special property of polymers.

Unit III: Leather chemistry **15 Hours**

3.1 Structure and compositions of hides, skins and leather. Principles of pretanning process, vegetable, mineral and synthetic tanning. Chemistry of chrome tanning.

3.2 Dyeing of leather – Tannery effluents – Pollution and control.

Unit IV: Agriculture chemistry I **15 Hours**

4.1 Soil – Definition, classification and properties of soil – soil water, soil oil, soil Temperature, soil minerals, soil colloids, soil pH, soil acidity and soil alkalinity.

4.2 Soil fertility and its evaluation – buffering of soil and its effect. Soil formation and its reclamation.

Unit V **15 Hours**

5.1 Importance of fertilizers – examples – secondary nutrients – role on the growth and development: compositing and manures.

5.2 Classification and examples for insecticides, fungicides and herbicides – fluorine compounds, boron compounds, arsenic compounds, mercury compounds, pyridine compounds ill effects of use of chemical fertilizers and insecticides.

TEXT BOOK & REFERENCES

INORGANIC CHEMISTRY:

Text Books:

1. Inorganic Chemistry – P.L. Soni - Sultan chand & company.
2. Inorganic Chemistry – R.D. Madhan – Sultan chand & company
3. A Text book of Inorganic Chemistry – A.K. De, New Age Publications.
4. General and Inorganic Chemistry (Part I and II) – Books and allied Publishers limited.

References:

1. Concise Inorganic Chemistry – J.D. Lee
2. Advanced Inorganic Chemistry – Cotton and Wilkinson.
3. Industrial Chemistry – B.K. Sharma, Goel Publications
4. Chemical Methods for Environmental Analysis, Ramesh and Anbu, Macmillan

ORGANIC CHEMISTRY:

Text Books:

1. Text book of Organic Chemistry – P.L. Soni, Sultan chand & company
2. Text book of Organic Chemistry – R.K. Bansal, New Age Publications.
3. Text book of Organic Chemistry – P.S. Kalsi –
4. Advanced Organic Chemistry – B.S. Bahl and Arun Bahl, S.Chand Publications.
5. Principles of Organic Chemistry – R.K. Bansal, New Age Publications.
6. Reaction Mechanisms in Organic Chemistry – S.M. Mukhergi and S.P. Singh, Macmillan Publications.
7. Stereochemistry, Conformation and Mechanisms – P.S. Kalsi,

References:

1. Organic Chemistry (Volume I and II) – I.L. Finar, Addision welsey
2. Organic Chemistry – R.T. Morrison and Boyd, Prentice Hall
3. Organic Chemistry – P.H. Pine, Mc-Graw Hill
4. Organic Chemistry – Solomons, John Wiley
5. Chemistry of Natural Products – O.P. Agarwal, Goel Publications.
6. Stereochemistry of Organic Compounds – D.Nasipuri – New Age Publications
7. Advanced General Organic Chemistry – S.M. Mukhergi and S.P. Singh – Macmillan.

PHYSICAL CHEMISTRY:

Text Books:

1. Text Book of Physical Chemistry – P.L. Soni – Sultan Chand.
2. Physical Chemistry – Kundu and Jain – S. Chand
3. Text Book of Physical Chemistry – S. Glasstone, Macmillan.
4. Physical Chemistry – G.W.Castellan – Narosa publishing house.
5. Physical Chemistry – Walter J.Moore – Orient Longman.
6. Principles of Physical Chemistry – B.R. Puri and Sharma – Shobanlal Nagin Chand & Co.

References:

1. Physical Chemistry – Negi and Anand – New Age Publication.
2. Physical Chemistry – K.L.Kapoor – Macmillan – 4 volumes.
3. Elements of physical chemistry – Glasstone and Lewis – Macmillan.
4. Fundamentals of physical chemistry – Maron and Landor – Colier – Macmillan.
5. Numerical Problems on Physical Chemistry Gashal, Books and Allied (p) Ltd.,

ANALYTICAL CHEMISTRY

Text books:

1. Analytical Chemistry – R. Gopalan- Sultan Chand & Sons.
2. Analytical Chemistry – S. Usharani, Macmillan.

References:

1. Vogel's textbook of quantitative inorganic analysis – Longman.
2. Fundamentals of analytical chemistry – D.A.Skoog and D.M.West.
3. Analytical Chemistry – S.M.Khopkar- New Age International
4. Instrumental methods of analysis – Douglas A.Skoog.
5. Instrumental methods of analysis – Merrit and Dean
6. Instrumental methods of chemical analysis – B.K. Sharma – Goel publishing house.
7. Physico – chemical techniques of analysis – P.B. Janarthanam. Vol-I and II-Asian publishing.

APPLIED CHEMISTRY:

References

1. A Text Books of Pharmaceutical chemistry – Jayashree Ghosi, S.Chand Publications, New Delhi.
2. Pharmaceutical Chemistry – S.Lakshmi, S.Chand Publications, New Delhi.
3. Pharmacology and Pharmatherapeutics (Vol. I and II) – R.S. Satoskar, Popular Prakashan.
4. Medicinal chemistry – Asutosh kar, New Age Publications, New Delhi.
5. A Text Book of synthetic drugs – O.D. Tyagi, Anmol Publications.
6. Introduction to Biological chemistry – J. Awapara, Prentice Hall.
7. A Text Book of Biochemistry – S. Ambika.
8. Biochemistry – A.L. Lehinger.
9. Essential of Biological chemistry – James Fanley, East west Press.
10. Outline of diary technology – Sukumar De.
11. Principles of diary technology – Robert Jenners.
12. Indian Diary products – K.S. Rangappa and K.T. Acharya.
13. Polymer chemistry – M.G. Arora, Anmol Publications, New Delhi.
14. Text Book of Polymer Science – F.W. Billmeyer, New Age International.
15. Chemical technology of leather – ISI
16. Fundamentals of leather science – Woodrofte.
17. Tanning process – Crthman.
18. Nature and properties of soils – Harry, O-buckman.
19. Soil Sciences – A. Sankara.
20. Industrial chemistry – B.K. Sharma.

THE NEW COLLEGE (AUTONOMOUS), CHENNAI – 14

B.Sc. DEGREE: BRANCH – IV CHEMISTRY

CBCS Pattern SYLLABUS

(Effective from the academic year 2008-2009)

PRACTICAL – ORGANIC ANALYSIS & PREPARATION

CODE:BCHMP 65 **Credits: 2** TEACHING HOURS: 75 Hours

OBJECTIVES OF THE COURSE:

1. To enable the students to analyze the given organic compound systematically and thereby able to report the functional group.
2. To train them to prepare an organic compound quantitatively.

(a) **Preparations**.

1. Preparation of benzaldehyde from benzoic acid
2. Preparation of methyl salicylate
3. Preparation of metadinitro benzene
4. Preparation of Picric acid
5. Preparation of Parabromoacetanalide
6. Preparation of methyl orange
7. Preparation involving benzoylation technique
8. Preparation involving Esterification method

(b) Organic analysis:

Reaction of the following functional groups: Aldehyde, ketone, carboxylic acid (mono and di), ester, carbohydrate (reducing and non reducing), phenol, aromatic primary amine, amide, nitro compound, diamide, and anilide.

The given organic compound containing one functional group should be analysed and to be reported with a characteristic derivative.

(c) Determination of boiling point and melting point (Demonstration only)

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PRACTICAL – GRAVIMETRIC ESTIMATION

CODE: BCHMP 66 Credits: 2 TEACHING HOURS: 75 Hours

OBJECTIVES OF THE COURSE

To impart sound knowledge of estimation of ions using gravimetric technique.

List of Experiments

1. Estimation of Sulphate as barium sulphate
2. Estimation of barium as barium sulphate
3. Estimation of barium as barium chromate
4. Estimation of lead as lead chromate
5. Estimation of silver as silver chloride
6. Estimation of calcium as calcium oxalate monohydrate
7. Estimation of nickel as DMG complex
8. Estimation of Zinc as magnesium oxinate

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CBCS PATTERN SYLLABUS

(Effective from 2008-2009)

ALLIED CHEMISTRY –I (SEMESTER III)

Code: BCHA 301 Teaching Hours: 60 Hours Credits: 3

Unit-I (15 Hours)

1.1 Chemical Bonding

Molecular Orbital (M.O) theory-bonding, anti-bonding and non-bonding orbital. Bond order. M.O configurations of H_2, He_2, N_2, O_2, F_2, Diamagnetism, and Para magnetism. VSEPR theory- Shapes of H_2O, NH_3, CH_4, BrF_3, IF_5, and IF_7 molecules.

1.2 Hydrides

Classification, preparation and properties.

1.3 Boron hydrides

Preparations, properties and structure of diborane. Preparation and chemistry of Sodium borohydride ($NaBH_4$), Borazole.

1.4 **Metals**

General methods of extraction of metals. Types of ores-methods of ore dressing, reduction methods-types of refining-electrolytic, Van Arkel and Zone refining. Extraction of Uranium, and Thorium. Role of Carbon in the properties of steel, heat treatment of steel-alloy steels and their uses.

Unit-II (15 Hours)

2.1 **Thermodynamics**

Types of systems, reversible and irreversible processes, isothermal and adiabatic processes and spontaneous processes. Statement of first law, second law thermodynamics. Carnot's cycle and efficiency of heat engine. Entropy and its significance. Free energy change and its importance (no derivation). Conditions for spontaneity in terms of S and G. Relationship between changes in G, H, T and S.

2.2 **Solutions**

Liquid in liquid type-Raoult's law for ideal solutions. Positive and negative deviation from Raoult's law-reasons and examples. Solution of gas in liquids-Henry's law.

Unit – III (15 Hours)

3.1 **Covalent Bond**

Orbital overlap hybridization and geometry of CH_4, C_2H_4, C_2H_2 and C_6H_6 molecules. Inductive effect, electromeric effect, mesomeric effect, and steric effects- examples and explanation.

3.2 **Stereoisomerism**

Elements of symmetry-symmetry and asymmetry-cause of optical activity. Isomerism of tartaric acid-racemisation and resolution. Geometrical isomerism of maleic and fumaric acids. Keto-enol tautomerism (definitions with examples only). Conformers of ethane and n-butane with brief explanation.

Unit – IV **(15 Hours)**

4.1 **Aromatic Compounds**

Aromaticity-Huckel's rule-Mechanisms of nitration, halogenation, alkylation, acylation and sulphonation of benzene. Preparation and properties of naphthalene-Haworth's synthesis.

4.2 Preparation and uses of Saccharin, Aspartane and Freon.

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(Effective from 2008-2009)

ALLIED CHEMISTRY –II (SEMESTER IV)

Code: BCHA 402 Teaching Hours: 60 Hours Credits: 3

Unit – I (15 hours)

1.1 Carbohydrates: Classification – properties of glucose and fructose – discussion about open – chain and ring structures of glucose and fructose. Mutarotation- conversion of glucose to fructose and fructose to glucose. Disaccharides- examples, inversion of cane sugar. Properties and uses of starch and cellulose and their derivatives.

Unit – II (15 hours)

2.1Aminoacids: Classification – acidic/basic/neutral amino acids–α, β, γ amino acids-

essential amino acids. Preparation and properties of α amino acids (glycine and alanine

only), isoelectric point and zwitter ion. Peptide synthesis. Proteins-Classification of

proteins by physical properties (globular, simple and conjugated proteins) and

biological functions of peptide hormones, protein hormones. Elementary ideas about

RNA and DNA.

2.2Chemotherapy: Preparation, uses and mode of action of sulpha drugs – Prontosil,

Sulphadiazine and Sulphafurazole. Uses of Penicillin, Chloramphenicol and

Streptomycin. Cause and treatment of – diabetes, cancer and AIDS.

Unit – III (15 hours)

3.1 Co-ordination chemistry: Nomenclature. Theories of Werner and Pauling. Examples and effects of chelation. Ionization isomerism, chemistry of EDTA.

3.2 Industrial chemistry: Fuel gases, natural gas, water gas, semi-water gas, carbureted water gas, producer gas, oil gas (composition and uses only). Synthesis, properties and uses of silicones.

3.3 Fertilizers: Preparation and uses of urea, ammonium sulphate, super phosphate,

triple super phosphate and NPK fertilizer.

Unit – IV (15 hours)

4.1 Photochemistry: Grotthus-Drapper's law and Stark-Einstein's law of photochemical equivalence. Quantum yield. Photosynthesis, phosphorescence, fluorescence, chemiluminescence and photosensitization – definition with examples.

4.2 Phase rule: Phase rule and the definition of terms in it. Applications of phase rule to water system. Two component system- Reduced phase rule and its application to a simple eutectic system (Pb-Ag).

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(Effective from 2009-2010)

ALLIED CHEMISTRY PRACTICAL

Code: BCHAP 41 Teaching Hours: 30 Hours Credits: 2

VOLUMETRIC ANALYSIS

1. Estimation of sodium hydroxide using sodium carbonate.
2. Estimation of hydrochloric acid using standard oxalic acid.
3. Estimation of oxalic acid using standard sulphuric acid.
4. Estimation of borax using sodium carbonate
5. *****Estimation of temporary and permanent hardness of water
6. Estimation of ferrous sulphate- standard Mohr salt solution
7. Estimation of oxalic acid -standard ferrous sulphate
8. Estimation of $KMnO_4$- standard NaOH
9. Estimation of ferrous ion using diphenylamine using internal indicator
10. Estimation of Zinc using EDTA- standard $MgSO_4$*****

ORGANIC ANALYSIS

Reaction of aldehyde (aromatic),

* ketone (aliphatic and aromatic),

carbohydrate,

carboxylic acid (mono and dicarboxylic),

phenol, aromatic primary amine,

amide and diamide.

Systematic analysis of organic compounds containing one functional group and characterization by confirmatory tests or derivatives.

*** Need not to be given for examinations**

Reference Books:

Inorganic Chemistry:

1. Inorganic Chemistry – P. L. Soni – Sultan Chand
2. Inorganic Chemistry – Puri and Sharma
3. Inorganic Chemistry – R. D. Madan – Sultan Chand
4. Advanced Inorganic Chemistry – Cotton and Wilkinson
5. A Text Book of Inorganic Chemistry– A. K. De – New Age International

Organic Chemistry:

1. Text Book of Organic Chemistry – P. L. Soni – Sultan Chand
2. Advanced Organic Chemistry – Bahl and Arun Bahl- Sultan Chand
3. Principles of Organic Chemistry – R. K. Bansal - New Age International
4. Organic Chemistry – I.L. Finar Vol. I & II – Addision Welsey
5. Text Book of Organic Chemistry – P. S. Kalsi Macmillan

Physical Chemistry:

1. Text Book of Physical Chemistry – P. L. Soni – Sultan Chand
2. Physical Chemistry –Negi Anand- New Age International
3. Physical Chemistry – Kundu and Jain – Sultan Chand
4. Principles of Physical Chemistry – Puri and Sharma – Shobanlal Nagin Chand & Co
5. Text Book of Physical Chemistry – Glasstone and Lewis – Macmillan.