

HAJEE KARUTHA ROWTHER HOWDIA COLLEGE

(An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai.)

Re-Accredited with “A” Grade by NAAC (CGPA of 3.26 out of 4.00)

Uthamapalayam - 625533



Department of Chemistry

B.Sc. Chemistry – Syllabus

Effective from the Academic Year 2014 – 2015

(I, II, III, IV, V & VI Semesters)

Choice Based Credit System

B.Sc., Chemistry (Semester)

Course Scheme, Scheme of Examinations & Syllabus

Effective from the academic year 2014 – 2015 onwards

Eligibility: A Pass in H.Sc., or any other Examination accepted by the University as Equivalent

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

OBJECTIVES OF THE COURSE:

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

SUBJECTS OF STUDY:

- Part – I - Tamil
- Part –II - English
- Part –III i) Core Subject – Chemistry
ii) Allied Subjects Botany / Zoology and Physics
- Part - IV i) Non-major subjects
ii) Skill based Subjects
iii) Environmental Studies
iv) Value Education
- Part-V Extension Activities

STRUCTURE OF THE QUESTION PAPERS:

Internal – 25 marks

External – 75 marks

Total = 100 marks

I. For Internal Examination: 25 marks

1. Two Tests to be conducted - 15 marks (average of 2 tests to be taken)
2. Group discussion / Seminar / Quiz - 5 marks
3. Two Assignments / Project - 5 marks each (average of 2 to be taken)
4. I Internal Examination - between 30th and 40th working days
5. II Test will be conducted - between 70th and 80th working days

II. External Examination: 75 marks

Question Paper Pattern: Three Parts A, B and C

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

III. Passing Marks

- No minimum for Internal exam
- Minimum 27 for External exam
- Eligibility for the degree - passing minimum is 40%

IV. Practical

- Internal - 40 marks (Observation note -10 and Model exam - 30)
- External - 60 marks
- Total - 100 marks
- Passing minimum is 40%

Details of number of Courses and Credits

| PART /SEM | I | II | III | IV | V | VI | Courses | | Credits |
|--|----------------------|------------------------|--------------------|--------------------|----------------------------------|----------------------------------|-------------|-------------------|------------------------------------|
| I ; Tamil | 1T:6 hrs | 1T:6 hrs | 1T:6 hrs | 1T:6 hrs | | | 4 | 4x3 | 12 |
| II ; English | 1T 6 hrs | 1T 6 hrs | 1T 6 hrs | 1T 6 hrs | | | 4 | 4x3 | 12 |
| III ; Core | 1T:4 hrs 1P:2 hrs | | | | | | 1 | 1x4 | 4 |
| | | 1T: 4 hrs 1P: 2 hrs | | | | | 1 1 | 1x4 1x2 | 4 2 |
| | | | 1T:4hrs 1P:2hrs | | | | 1 | 1x4 | 4 |
| | | | | 1T:4hrs 1P:2hrs | | | 1 1 | 1x4 1x2 | 4 2 |
| | | | | | 3T:12hrs 2P: 6hrs 1P: 2hrs | | 3 | 3x4 | 12 |
| | | | | | | 3T:12hrs 2P: 6hrs 1P: 2hrs | 3 2 1 | 3x4 2x5 1x4 | 12 10 4 |
| III ; Allied-I Zoology / Botany | 1T: 4hrs 1P:2 hrs | 1T:4hrs 1P:2 hrs | 1T:4hrs 1P:2hrs | 1T:4hrs 1P:2hrs | | | 4 2 | 4x4 2x1 | 16 2 |
| III ; Allied- II Physics | | | 1T:4hrs 1P:2hrs | 1T:4hrs 1P:2hrs | 1T: 4hrs 1P:2 hrs | 1T: 4hrs 1P: 2 hrs | 4 2 | 4x4 2x1 | 16 2 |
| IV ; NME | 1T:2 hrs | 1T: 2 hrs | | | | | 2 | 2x2 | 4 |
| IV ; SBS | 2T:4 hrs | 2T: 4 hrs | | | 1T: 2 hrs | 1T:2 hrs | 6 | 6x2 | 12 |
| IV ; ES | | | | | 1T: 2 hrs | | 1 | 1x2 | 2 |
| IV ; VE | | | | | | 1T: 2 hrs | 1 | 1x2 | 2 |
| V ; EA | | | | | | 1T: 0 hrs | 1 | 1x2 | 2 |
| Total hours | 30 | 30 | 30 | 30 | 30 | 30 | | | |
| Total Courses | 7 | 9 | 5 | 8 | 6 | 11 | 46 | | |
| Total Marks | | | | | | | 4600 | | |
| Total Credits | 20 | 23 | 18 | 22 | 20 | 37 | | | 140 |

DETAILS OF COURSE CATEGORY, CODE, CREDITS & TITLE

| Part | Course Category | Course Code | Course Title | Hrs/ Week | CIAE | TEE | Max. Marks | Credits |
|----------------------|------------------------|------------------------------------|--|-----------|------------|------------|------------|-----------|
| SEMESTER – I | | | | | | | | |
| I | Language – I | 14UTAL11/ 14UARL11/ 14UMAL11 | Tamil/Arabic/Malayalam | 6 | 25 | 75 | 100 | 3 |
| II | English – I | 14UENL11 | English for Enrichment – I | 6 | 25 | 75 | 100 | 3 |
| III | Core | 14UCHC11 | General Chemistry - I | 4 | 25 | 75 | 100 | 4 |
| III | Core | 14UCHC2P | Inorganic Semi micro Qualitative Analysis | 2 | - | - | - | - |
| III | Allied | 14UBYA11/ 14UZYA11 | Ancillary Botany/Zoology - I | 4 | 25 | 75 | 100 | 4 |
| III | Allied | 14UBYA2P/ 14UZYA2P | Ancillary Practical Botany/Zoology - I | 2 | - | - | - | - |
| IV | SBS | 14UCHS11 | Perfume chemistry and sugar technology | 2 | 25 | 75 | 100 | 2 |
| IV | SBS | 14UCHS12 | Fundamentals in Chemistry-I | 2 | 25 | 75 | 100 | 2 |
| IV | Non Major Elective – I | 14UCHN11 | Industrial Chemistry | 2 | 25 | 75 | 100 | 2 |
| Total | | | | 30 | 175 | 525 | 700 | 20 |
| SEMESTER – II | | | | | | | | |
| I | Language – II | 14UTAL21/ 14UARL21/ 14UMAL21 | Tamil/Arabic/Malayalam | 6 | 25 | 75 | 100 | 3 |
| II | English – II | 14UENL21 | English Paper – II | 6 | 25 | 75 | 100 | 3 |
| III | Core | 14UCHC21 | General Chemistry –II | 4 | 25 | 75 | 100 | 4 |
| III | Core | 14UCHC2P | Inorganic Semi micro Qualitative Analysis | 2 | 40 | 60 | 100 | 2 |
| III | Core | 14BYA21/ 14UZYA21 | Ancillary Botany/Zoology-II | 4 | 25 | 75 | 100 | 4 |
| III | Allied | 14UBYA2P/ 14UZYA2P | Ancillary Practical Botany/Zoology -1 | 2 | 40 | 60 | 100 | 1 |
| IV | SBS | 14UCHS21 | Leather technology and paper and pulp technology | 2 | 25 | 75 | 100 | 2 |
| IV | SBS | 14UCHS22 | Fundamentals in Chemistry-II | 2 | 25 | 75 | 100 | 2 |
| IV | NME | 14UCHN21 | Drugs and Cosmetics | 2 | 25 | 75 | 100 | 2 |
| Total | | | | 30 | 255 | 645 | 900 | 23 |

B.Sc., Chemistry 2014 – 15 onwards

| Part | Course Category | Course Code | Course Title | Hrs/ Week | CIAE | TEE | Max. Marks | Credits |
|-----------------------|------------------------|--|--|------------------|-------------|------------|-------------------|----------------|
| SEMESTER – III | | | | | | | | |
| I | Language-III | 14UTAL31/ 14UARL31/ 14UMAL31 | Tamil/Arabic/Malayalam | 6 | 25 | 75 | 100 | 3 |
| II | English – III | 14UENL31 | English for Enrichment –III | 6 | 25 | 75 | 100 | 3 |
| III | Core | 14UCHC31 | Physical Chemistry-I | 4 | 25 | 75 | 100 | 4 |
| III | Core | 14UCHC4P | Volumetric Analysis | 2 | - | - | - | - |
| III | Allied | 14UPHA11 | Ancillary Physics-I | 4 | 25 | 75 | 100 | 4 |
| III | Allied | 14UPHA2P | Ancillary Physics Practical-I | 2 | - | - | - | - |
| III | Allied | 14UBYA31/ 14UZYA31 | Ancillary Botany/Zoology – III | 4 | 25 | 75 | 100 | 4 |
| III | Allied | 14UBYA4P/ 14UZYA4P | Ancillary Botany/Zoology Practical –II | 2 | - | - | - | - |
| Total | | | | 30 | 125 | 375 | 500 | 18 |
| SEMESTER – IV | | | | | | | | |
| I | Language – IV | 14UTAL41/ 14UARL41 / 14UMAL41 | Tamil/Arabic/Malayalam | 6 | 25 | 75 | 100 | 3 |
| II | English – IV | 14UENL41 | English for Enrichment - IV | 6 | 25 | 75 | 100 | 3 |
| III | Core | 14UCHC41 | Inorganic Chemistry-I | 4 | 25 | 75 | 100 | 4 |
| III | Core | 14UCHC4P | Volumetric Analysis | 2 | 40 | 60 | 100 | 2 |
| III | Allied | 14UPHA21 | Ancillary Physics-II | 4 | 25 | 75 | 100 | 4 |
| III | Allied | 14UPHA2P | Ancillary Physics Practical-I | 2 | 40 | 60 | 100 | 1 |
| III | Allied | 14UBYA41 / 14UZYA41 | Ancillary Botany/Zoology -IV | 4 | 25 | 75 | 100 | 4 |
| III | Allied | 14UBYA4P / 14UZYA4P | Ancillary Botany/Zoology Practical -II | 2 | 40 | 60 | 100 | 1 |
| V | EA | 14UEAC61 | Extension Activities | 0 | 25 | 75 | 100 | 2 |
| Total | | | | 30 | 270 | 630 | 900 | 24 |

B.Sc., Chemistry 2014 – 15 onwards

| SEMESTER – V | | | | | | | | |
|----------------------|------------------------|--------------------|--|------------------|-------------|-------------|-------------------|----------------|
| Part | Course Category | Course Code | Course Title | Hrs/ Week | CIAE | TEE | Max. Marks | Credits |
| III | Core | 14UCHC51 | Organic chemistry-I | 4 | 25 | 75 | 100 | 4 |
| III | Core | 14UCHC52 | Physical chemistry -II | 4 | 25 | 75 | 100 | 4 |
| III | Core | 14UCHC53 | Inorganic, analytical and Applications of Computers in Chemistry | 4 | 25 | 75 | 100 | 4 |
| IV | SBS | 14UCHS51 | Pharmaceutical and Medicinal chemistry | 2 | 25 | 75 | 100 | 2 |
| III | Core | 14UCHC6P | Gravimetric estimation and organic preparation | 3 | - | - | - | - |
| III | Core | 14UCHC6Q | Organic estimation and organic analysis | 3 | - | - | - | - |
| III | Core | 14UCHC6R | Physical chemistry practicals | 2 | - | - | - | - |
| III | Allied | 14UPHA31 | Ancillary physics - III | 4 | 25 | 75 | 100 | 4 |
| III | Allied | 14UPHA4P | Ancillary physics practical -II | 2 | - | - | - | - |
| IV | EVS | 14UEVS51 | Environmental Studies | 2 | 25 | 75 | 100 | 2 |
| Total | | | | 30 | 150 | 450 | 600 | 20 |
| SEMESTER – VI | | | | | | | | |
| III | Core | 14UCHC61 | Organic chemistry -II | 4 | 25 | 75 | 100 | 4 |
| III | Core | 14UCHC62 | Physical Chemistry - III | 4 | 25 | 75 | 100 | 4 |
| III | Core | 14UCHC63 | Applied Chemistry | 4 | 25 | 75 | 100 | 4 |
| III | Core | 14UCHC6P | Gravimetric Estimation and Organic Preparation | 3 | 40 | 60 | 100 | 5 |
| III | Core | 14UCHC6Q | Organic Estimation and Organic Analysis | 3 | 40 | 60 | 100 | 5 |
| III | Core | 14UCHC6R | Physical Chemistry Practical | 2 | 40 | 60 | 100 | 4 |
| III | Allied | 14UPHA41 | Ancillary physics - IV | 4 | 25 | 75 | 100 | 4 |
| III | Allied | 14UPHA4P | Ancillary physics practical -II | 2 | 40 | 60 | 100 | 1 |
| IV | VED | 14UEVD61 | Value Education | 2 | 25 | 75 | 100 | 2 |
| IV | SBS | 14UCHS61 | Medical Laboratory Technology & Clinical Biochemistry | 2 | 25 | 75 | 100 | 2 |
| Total | | | | 30 | 310 | 690 | 1000 | 35 |
| Grand Total | | | | 180 | 1185 | 3015 | 4600 | 140 |

I SEMESTER**Core Subject Paper –1****Part-III**

| | | |
|-----------------|------------------------------|---------------------------|
| 14UCHC11 | General Chemistry - I | Hours 4/ Credits 4 |
|-----------------|------------------------------|---------------------------|

Unit - I**Introduction to Organic Chemistry**

Organic compounds- Purification – crystallization, sublimation, distillation, steam distillation, extraction with a solvent - Empirical and Molecular formulae -molecular weight calculations - Detection and Estimation of elements - nitrogen, sulphur and halogens.

Unit - II**Organic Reactions and their mechanism**

Inductive effect - Mesomeric effect - Electromeric effect - Homolytic and heterolytic fission- Carbonium ions – Carbanions- Carbon free radicals – Carbenes – Hyperconjugation - Electrophiles and Nucleophiles - Types of organic reactions - Hydrogen bonding: Resonance concept.

Unit - III

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

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

Unit - IV**Gaseous State –I**

Kinetic theory of gases – Postulates-Kinetic gas equation - derivation - Gas laws and its derivation from the kinetic gas equation - Real gases – Deviations of real gases from ideal behavior - Explanation for deviations -van der Waals equation of states – derivation - Other

equations of states- Dieterici, Berthelot. Clausius equation, Radlich-Kwong equation (no derivation).

Unit-V

Gaseous State -II

Critical phenomenon of gases: PV Isotherms-Andrews experiment--significance of critical constants – compressibility factor for ideal and real gases- Boyle temperature - Relation between van der Waals constants and critical constants - principle of corresponding states and reduced equation of state.

Types of Molecular velocities – Mean, Most probable and root mean square velocities - Calculation of molecular velocities, Maxwell - Boltzmann distribution of molecular velocities (no derivation) - Graphical representation and its significance – Effect of temperature on velocity distribution.

References:

1. B. S. Bahl & Arun Bahl – Advanced Organic Chemistry (S. Chand & company Ltd. – 2009).
2. Puri, Sharma and Pathania. Principles of Physical chemistry.
3. P.L. Soni, O.P. Dharmarha and U.N. Dash. Textbook of physical chemistry
4. B.S.Bahl, Arun Bahl and G.D.Tuli ‘Essentials of physical chemistry
5. R.Gopalan, P.S. Subramanian and K.Rengarajan. Elements of Analytical Chemistry.
6. Arthur, I., Vogel. A text book of quantitative inorganic analysis.

I SEMESTER

Skill Based subject-1

Part - IV

| | | |
|----------|---|-------------------|
| 14UCHS11 | Perfume Chemistry and Sugar Technology | Hours 2/Credits 2 |
|----------|---|-------------------|

Unit – I

Definition of perfumes- Sources of perfumes from plants and animals -Essential oils- functional groups containing essential oils- Methods of isolation of essential oils -Steam distillation, expression, enfleurage, prickling - Synthetic perfumes- Introduction – Esters of benzyl alcohol, cinnamic acid citronellol.

Unit – II

Synthesis of Civetone, Muscone, coumarin and Ionones - nitro musks – Vanillin.

Unit – III

Natural perfumes- Acacia -Carnation, Jasmine, Lily, Orange blossom, Rose - Fruit flavours - Apple, banana, grapes and pineapple.

Unit – IV

Sugar industries in Tamilnadu – India - composition of sugar cane and sugar beet- Manufacture of sugar from sugar beet- Testing and estimation of sugars by polarimeter and specific gravity methods.

Unit – V

Manufacture of sugar from sugar cane-extraction of juice- sulphitation- double sulphitation- carbonation- double carbonation-concentration- separation of crystals-recovery of glucose from molasses-grading of sugars.

Note: Visit to a factory and submission of report/assignment -5 marks(Internal)

References:

1. Industrial Chemistry B.K.Sharma – Goel Publishing House

I SEMESTER

Skill Based subject-2

Part - IV

| | | |
|----------|-----------------------------|-------------------|
| 14UCHS12 | Fundamentals in Chemistry I | Hours 2/Credits 2 |
|----------|-----------------------------|-------------------|

Unit - I

Mathematical Concepts -Inclination of a line and the slope of a line-General equation of a Straight line-Slope & intercept form-slope & point form-Two points form-intercept form-Parallel and perpendicular lines- Curve sketching. Differentiation-Differentiate $\sin x$, e^x , $\log x$ and x^n - Partial differentiation - The Euler reciprocal relation - Matrices and determinants - Product of two matrices – Inverse matrix (including problems).

Unit - II

Symbols, meanings and SI units - Useful constants and their values in SI values and cgs units-Common system of measurements- Prefixes used for decimal fractions-Important conversion factors.

Unit - III

Introduction to Inorganic chemistry- Definition- Periodic table- Classification of elements- Electronic configuration of elements- Aufbau principle- Hund's rule of maximum multiplicity- Half and completely filled orbitals.

Unit - IV

Introduction to organic chemistry - Sources and Classification of organic compounds - Definition – vital force theory – various functional groups – homologous series – alcohol, amines, acids, esters, aldehydes and ketones.

Unit -V:

IUPAC nomenclature taking examples from aliphatic and aromatic chemistry involving the functional groups (alcohols, amines, acids, esters, aldehydes and ketones).

References:

1. B.S.Bahl and Arun Bahl – Advanced Organic Chemistry (S. Chand & company Ltd. – 2009).
2. Puri, Sharma and Pathania. Principles of Physical chemistry.
3. B.S. Bahl, Arun Bahl and G.D. Tuli ‘Essentials of Physical Chemistry
4. R.D. Madan. Modern Inorganic chemistry.

I SEMESTER**Non Major Elective-1****Part – IV**

| | | |
|-----------------|-----------------------------|--------------------------|
| 14UCHN11 | Industrial Chemistry | Hours 2/Credits 2 |
|-----------------|-----------------------------|--------------------------|

Unit – I - Agricultural Industry

Nutrients for plants – Role of various elements in plant growth – Classification of Fertilizers – Urea, Super phosphate and Potassium Nitrate – Mixed fertilizer – Fertilizer Industries in India.

Unit – II - Insecticides and Pesticides

Definition – Classification – Inorganic Pesticides Lead Arsenate, Paris Green, Lime, sulphur, hydrocyanic acid, organic pesticides – Natural, Synthetic DDT – Fungicides – repellants.

Unit – III - Oils and Fats

Manufacture of soap and detergents – cleaning action, Saponification value, Iodine value, Reichert Meissl value, acid value – Definition and their determination.

Unit – IV - Polymer chemistry

Natural and Synthetic rubbers – composition of natural rubber – examples - Types of Polymerisation – Addition - condensation – Copolymer – Homopolymer – Definition of natural and synthetic fibers and resins – Distinction between resins and plastics- classification of plastics – properties – Bakelite, urea formaldehyde, Teflon, Nylon-66 and Dacron.

Unit – V - Nuclear power plants

Nuclear power plants in India- nuclear fuels – concepts of nuclear fission, fusion and energy production – nuclear waste disposal and hazards.

Visit to various Industries and submission of report - 5 marks (Internal)

References:

1. Industrial Chemistry – By B.K. Sharma (Goel Publishers).
2. Singh and VK Kapoor – Organic Pharmaceutical Chemistry.
3. S. Lakshmi – Pharmaceutical Chemistry.
4. Applied Chemistry – K.Bagavathi Sundari.

II SEMESTER

Core Subject Paper –2

Part-III

| | | |
|----------|------------------------|-------------------|
| 14UCHC21 | General Chemistry - II | Hours 4/Credits 4 |
|----------|------------------------|-------------------|

Unit - I

Classical concept of Bonding - Valency of carbon- Bond lengths and Bond energies-Modern concept of Bonding, sp^3 , sp^2 and sp hybridizations of carbon- Polar and non polar molecules (sp^3 - CH_4 , H_2O , NH_3 – sp^2 - $CH_2=CH_2$, sp - $CH\equiv CH$).

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

Unit- II**Periodic Properties**

Variation of effective nuclear charge in the periodic table - In Period and Group - Application of effective nuclear charge - Atomic volume - Variation of atomic volume in a Period and Group - Atomic and ionic radii - Atomic or metallic radius – van der Waals radius - Variation of atomic and ionic radii in a Period and Group - Ionization energy - Factors affecting the magnitude of ionization Potential - Variation of ionization potential of the element in a Group and Period - Electron affinity - Factors affecting the magnitude of electron affinity - Variation of electron affinity in a Group and Period - Application of ionization potential and electron affinity - Electronegativity – Variation of electro negativity in a Period and a Group – Applications of electronegativity .

Unit-III**Atomic Structure**

Dalton's theory –J. J. Thomson discovery of electron –Discharge tube experiment– Thomson's atomic model - Rutherford's atomic model- Alpha particles Scattering experiment – Moseley's determination of atomic number – Bohr's atomic Model –Postulates of Bohr's theory – Derivation of radius and energy of Bohr's orbit –Bohr's explanation of hydrogen spectrum- Merits and demerits of Bohr's theory- Stark effect and Zeeman effect- Sommerfield modification of atomic model.

Unit – IV

Quantum Mechanics-I

Dualism of light – Wave nature of radiation - classical theory of electromagnetic radiation and classical expression for energy in term of amplitude - Particle nature of radiation – Black body radiation and Planck’s quantum theory, photo-electric effect and Compton effect– de Broglie hypothesis – Heisenberg’s uncertainty principle.

Unit – V

Quantum Mechanics-II

Schrodinger wave equation (no derivation) – argument in favour of Schrodinger wave equation - Physical significance of (ψ) function - Properties of function – well – behaved function - Quantum numbers and their significance - Wave picture of electron – Concept of atomic orbitals - Shapes of s, p and d orbitals. Nodal planes and nodal points in atomic orbitals ‘g and ‘u character of atomic orbitals.

References:

1. S.Bahl, Arun Bahl ‘Advanced Organic Chemistry’
2. I.L. Finar ‘Organic Chemistry’ Vol. I
3. P.L. Soni ‘Organic Chemistry’
4. Puri, Sharma and Pathania. Principles of Physical chemistry.
5. P.L. Soni, O.P. Dharmarha and U.N. Dash. Textbook of physical chemistry
6. B.S. Bahl, Arun Bahl and G.D. Tuli ‘Essentials of physical chemistry
7. R.D. Madan. Modern Inorganic chemistry.

II SEMESTER**Skill Based Subject-3****Part - IV**

| | | |
|-----------------|---|--------------------------|
| 14UCHS21 | Leather Technology & Paper and Pulp Technology | Hours 2/Credits 2 |
|-----------------|---|--------------------------|

Unit – I

History of leather industry in Tamilnadu -India– Animal skin-structure- manufacture of leather-flaying-soaking-curing-liming-deliming-unhairing-bating-fleshing-pickling

Unit – II

Tanning process-vegetable tanning process-chrome tanning process-one bath and two bath process-finishing of leather. Treatment of tannery effluent-primary, secondary and tertiary processes.

Unit – III

Introduction, Manufacture of Pulp, Various raw materials used for the preparation of pulp- Mechanical process of manufacturing pulp.

Unit – IV

Chemical processes of manufacturing pulp- Sulphite Pulp, sulphate pulp, Rag Pulp.

Unit – V

Various processes: Beating, Refining, Filling sizing and colouring - Manufacture of paper, calendaring and uses.

Visit to a Tannery Industry and paper industries and submission of report/assignment-5 marks (Internal)

References:

1. Industrial Chemistry by B.K. Sharma.

II SEMESTER

Skill Based subject-4

Part - IV

| | | |
|----------|------------------------------|-------------------|
| 14UCHS22 | Fundamentals in Chemistry-II | Hours 2/Credits 2 |
|----------|------------------------------|-------------------|

Unit-I Oxidation and Reduction

Concepts of oxidation-reduction in terms of oxidation number – calculation of oxidation number – redox reactions – half reactions – Balancing ionic equations by ion electron method (half reaction) - Reactions involving $\text{Cr}_2\text{O}_7^{2-}$ and Fe^{2+} , MnO_4^- and Fe^{2+} , $\text{Cr}_2\text{O}_7^{2-}$ in acid medium - CrO_4^{2-} and SO_3^{2-} .

Unit-II Colloids

Colloidal States of matter-various types-classification

- Solids in liquids: Sols- properties, kinetic, optical and electrical properties-stability of colloids and protective action –Hardy-Schultz law- Gold number-Hofmeister series
- Liquids in liquids (emulsions): types of emulsion-emulsifier with an example.
- Liquids in solids (Gels): Classification Thixotropy-Syneresis and inhibition-Applications of colloids.

Unit-III Volumetric Analysis

Definitions of Molarity - Normality - Molality and mole fraction - their calculations - definition and examples for primary and secondary standards - Calculation of equivalent weight of acid, base, oxidizing agent, reducing agent and salt - Principle of Volumetric Analysis - Types of titrations- acid-base – permanganometry, Dichrometry Argentometry, Iodometric and Iodimetric titrations.

Unit-IV

Theories of indicators - acid-base indicators - Choice of indicators -Adsorption indicators.

Unit-V Aliphatic Hydrocarbons

- Alkanes: General methods of preparation, properties and uses. (CH_4 , C_2H_6)
- Alkenes: General methods of preparation, properties and uses. ($\text{CH}_2=\text{CH}_2$, $\text{CH}_2=\text{CH}-\text{CH}_3$), Markovnikov's Rule and peroxide effect.
- Alkynes: General methods of preparation, properties and uses. ($\text{CH}\equiv\text{CH}$)

References:

- S.Bahl, Arun Bahl 'Advanced Organic Chemistry'
- I.L. Finar 'Organic Chemistry' Vol. I
- P.L. Soni 'Organic Chemistry'
- Puri, Sharma and Pathania. Principles of Physical chemistry.

5. P.L. Soni, O.P. Dharmarha and U.N. Dash. Textbook of physical chemistry
6. B.S.Bahl, Arun Bahl and G.D.Tuli 'Essentials of physical chemistry
7. R.D.Madan. Modern Inorganic chemistry.

II SEMESTER

Non Major Elective-2

Part - IV

| | | |
|----------|---------------------|-------------------|
| 14UCHN21 | Drugs and Cosmetics | Hours 2/Credits 2 |
|----------|---------------------|-------------------|

Unit – I

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

Unit – II

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

Unit – III

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

Unit – IV

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

Unit – V

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

Visit to various Industries and submission of report - 5marks (Internal)

Preparation of cosmetics to be demonstrated

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

References :

1. Albert Burger -Medicinal Chemistry
2. G.R.Chatwal -Medicinal Chemistry
3. S. Lakshmi - Pharmaceutical Chemistry
4. ISI Manuals (Contact DIC).

III SEMESTER

Core Subject Paper –3

Part - III

| | | |
|----------|------------------------|-------------------|
| 14UCHC31 | Physical Chemistry – I | Hours 4/Credits 4 |
|----------|------------------------|-------------------|

Unit – I

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

Physical properties and chemical constitution

Molar volume and its application - Surface tension – influence of temperature on surface tension – Parachor – atomic and structural Parachors – applications - Viscosity – influence of temperature on viscosity – relation to chemical constitution – molecular viscosity – atomic and structural viscosity – Rheochor - Refraction – refractive index – specific refractive index – molar, atomic and structural refraction – applications – liquid crystal – their applications.

Unit – II

Dipole moment – definition – electrical polarization of molecule – Clausius Mosotti equation – Debye equation – experimental determination – moment of linkage and groups – various applications.

Magnetic moment - Magnetic susceptibility – para, dia and ferro magnetism – specific, molar magnetic susceptibility and constitution – determination by Gouy's method – various applications.

Unit – III

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

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

Unit – IV

Collision diameter - collision number - collision frequency - mean free path. - Liquefaction of gases – Linde's method – Claude's method - Brownian movement – Loschmidt numbers – the degrees of freedom – translational, vibrational and rotational

degrees of freedom for linear and non-linear molecules such as water and carbon dioxide - Principles of equipartition energy.

Unit-V

Solid State

- a. Laws of crystallography – law of constancy of interfacial angle, law of symmetry, law of rational indices – Miller indices – symmetry elements in a crystal – calculations involving interplanar spacing in crystal systems.
- b. X-ray diffraction – Bragg's equation – experimental method of determination of interplanar spacing – X-ray spectrophotometer – the Debye – Scherrer's method.
- c. Types of crystals – ionic, molecular, covalent, and metallic crystals.
 - a. Ionic crystals - Analysis of NaCl, KCl, CsCl – determination of Avogadro number.
 - b. Molecular crystals – Water and ammonia.
 - c. Covalent crystals – Diamond and graphite.
 - d. Metallic crystals – Metallic bond in metals.
 - e. Conductors, insulators and semiconductors – Frenkel and Schottky defects.

References:

1. Principles of Physical chemistry, Puri, Sharma and Pathania, Vishal Publishing Co. 2012 edition.
2. Textbook of physical chemistry, P.L. Soni, O.P.Dharmarha and U.N.Dash. , Sultan Chand and sons, 2012 edition.
3. Essentials of physical chemistry, B.S.Bahl, Arun Bahl and G.D.Tuli, S. Chand and Company Pvt. Ltd.

IV SEMESTER

Core Subject Paper – 4

Part - III

| | | |
|----------|-----------------------|-------------------|
| 14UCHC41 | Inorganic Chemistry I | Hours 4/Credits 4 |
|----------|-----------------------|-------------------|

Unit - I

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

Unit -II

Nuclear chemistry -Composition of the nucleus – nuclear forces – mass defect – binding energy – nuclear stability.

Soddy's group displacement law – illustration – law of radioactive disintegration.

Nuclear fission: Definition – the principle of atom bomb.

Nuclear fusion: Definition – emission of energy – Stellar energy – hydrogen bomb.

Applications of radioactivity – medicine, agriculture, industry and analytical fields – carbon dating.

Unit- III**Co-ordination Compounds**

Introduction – Nomenclature – Werner's theory – Sidgwick theory - EAN rule applied to Ni and Co carbonyls.

Valence bond theory - low spin and high spin complexes of Fe and Co - Colour and magnetic properties of co-ordination complexes- Limitations of VB theory - Crystal field theory – Octahedral, tetrahedral and square planar complexes - Modified CFT – ligand field theory.

Unit - IV

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

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

Unit- V

The Inner Transition Elements

- a. The lanthanide series – Occurrence – Properties - electronic configuration, oxidation states, ionic radii-lanthanide contraction- consequences- causes, color, magnetic properties, oxidation potential, basic character, solubility of compounds, double salts, complexes - Extraction of lanthanides from monazite sand.
- b. The actinide series – Sources - Transuranic elements – Preparation - Electronic configuration – Properties - Oxidation states - Ionic radii – Color of ions - Comparison of actinides with lanthanides.

References:

1. PL. Soni. Text book of Inorganic chemistry.
2. Puri, Sharma and Kalia. Principles of Inorganic Chemistry.
3. R.D. Madan- Modern Inorganic Chemistry.
4. Nuclear chemistry -Arnikar

V SEMESTER

Core subject paper – 5

Part - III

| | | |
|----------|-----------------------|-------------------|
| 14UCHC51 | Organic Chemistry – I | Hours 4/Credits 4 |
|----------|-----------------------|-------------------|

Unit – I**Aromatic Compounds - I**

- Introduction - general characteristics of aromatic compounds. Aromaticity and Huckel's rule. Structure of benzene – M.O. Model.
- Mechanism of aromatic electrophilic substitution (Halogenations, nitration, Sulphonation and Friedel – Crafts reactions).
- Directive influence of substituents based on electronic effects (detailed study).
- Trisubstituted benzenes – steric hindrance and rules for trisubstitution in benzene.
- Mechanism of aromatic nucleophilic substitution: Unimolecular, bimolecular and benzyne mechanisms.

Unit – II**Aromatic Compounds – II****Aromatic hydrocarbons, halogen, nitro and amino compounds**

- Preparation, Properties and uses of toluene, Xylene and mesitylene
- Aromatic halogen compounds: Preparation, properties and uses of bromobenzene and benzyl bromide- Reactivity of aryl halides, distinction between nuclear and side chain halogenated derivatives.
- Aromatic nitro compounds: preparation and properties of nitrotoluenes and nitrobenzene.
- Aromatic amino compounds: Preparation by reduction of nitro compounds and from chlorobenzene. Effect of substituents on the basic character of aromatic amines: Comparison between aliphatic and aromatic amines. Estimation of aniline. Preparation of sulphanic acid, nitroanilines and phenylene diamines.
- Preparation and synthetic applications of benzene diazonium chloride.

Unit – III

Aromatic compounds – II

- a. Aromatic aldehydes: Benzaldehyde – Mechanism of Cannizzaro, Perkins, Claisen, Knoevenagel reaction and benzoin condensation.
- b. Preparation & Properties of cinnamaldehyde & vanillin.
- c. Phenolic ketones: Chloroacetophenone – Preparation – Houben-Hosch synthesis.
- d. Phenols: Acidity of phenols – effect of substituents on the acidity of phenol, mechanism of Kolbe's reaction.

Unit – IV

Aromatic acids

- a. Effect of substituents on acidic Character.
- b. Substituted acids: Preparation, Properties of salicylic acid and anthranilic acid.
- c. Dicarboxylic acids: Preparation, properties of phthalic acid, phenylacetic acid, mandelic acid, cinnamic acid & coumarin.
- d. Aromatic sulphonic acids: preparation, Properties and uses of benzene sulphonic acid, saccharin, chloramine – T and dichloramine – T.

Unit – V

Poly nuclear hydrocarbons and their derivatives:

- i. Isolated systems: Preparation and properties of diphenyl, benzidine diphenic acid, diphenylmethane, triphenylmethane and stilbene
- ii. Condensed systems: Preparation, properties, uses and structure of Naphthalene, Naphthylamines, Naphthols, Naphthaquinones, anthracene, anthraquinone, alizarin and phenanthrene.

References:

1. P. L. Soni And Chawla – Text book of Organic Chemistry (Sulthan Chand – 2012).
2. B. S. Bahl & Arun Bahl – Advanced Organic Chemistry (S. Chand & Company Ltd. 2009).
3. I.L. Finar – Organic Chemistry (Volume – I) – Pearson Education – VI Edition.

V SEMESTER

Core subject paper - 6

Part - III

| | | |
|----------|-----------------------|---------------------|
| 14UCHC52 | Physical Chemistry II | Hours 4 / Credits 4 |
|----------|-----------------------|---------------------|

Unit I

Thermodynamics I

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

Unit II

Thermodynamics II

1. Limitations of I law of thermodynamics – spontaneous process – statement of II law – conversion of heat into work - thermodynamic efficiency – Carnot cycle – refrigeration cycle – Carnot theorem – Kelvin scale of temperature.
2. **Entropy** – definition and significance – derivation of the concept of entropy – entropy changes in reversible and irreversible (spontaneous) processes. Entropy as a thermodynamic function – dependence of entropy on the variables of the system for ideal gases – entropy of mixing of gases – ΔS for physical transformation in chemical reactions – entropy and probability.
3. **Free energy function** – Helmholtz free energy (A) – definition and its temperature dependence – Gibbs free energy (G) – definition, variation of Gibbs free energy with temperature and pressure. Gibbs – Helmholtz equation and its applications – Maxwell's relationships – criteria for reversible and irreversible processes in terms of entropy and free energy changes.
4. **Partial molar quantities** – Definition and significance of chemical potential – Gibbs – Duhem equation – variation of chemical potential with temperature and pressure – chemical potential in the case of system of ideal gases. Clausius – Clapeyron equation –

derivation and applications – thermodynamic properties of real gases – fugacity and activity concepts.

Unit III

Thermodynamics III

1. Application of thermodynamics to various type of equilibria – equilibrium constant and free energy changes – van't Hoff reaction isotherm and Van't Hoff isochore – thermodynamic interpretation of law of mass action and Lechatelier principle.
2. Thermodynamics of ideal solution – free energy change of mixing, enthalpy changes of mixing and entropy changes of mixing – relation between osmotic pressure and vapour pressure lowering - thermodynamic derivation – relation between the depression of freezing point and concentration – elevation of boiling point and concentration – thermodynamic derivations. Thermodynamics III – Nernst heat theorem and its applications third law of Thermodynamics.

Unit – IV

Chemical Kinetics

- a. Second, third and zero order reactions – examples – rate equations – Derivation of rate equations - half life period.
- b. Influence of temperature on the rate of reaction – Arrhenius rate equation and its significance – measurement of parameters. Theory of reaction rates: Bimolecular collision theory – unimolecular reactions – Lindemann's hypothesis – Absolute Reaction Rate theory.
- c. Influence of ionic strength on reaction rate – primary and secondary salt effect – kinetics of fast reactions – relaxation method.

Unit – V

Phase Rule

- a. Definitions of terms – Gibbs phase rule – one component system – water, carbon di oxide and sulphur – polymorphism – two component system – reduced phase rule – simple eutectic system – Pb-Ag system – KI-water system
- b. Partially miscible liquid system – CST – completely immiscible liquid system.
- c. Nernst Distribution law: Mathematical formulation – experimental verification – condition under which the law is obeyed

References:

1. Principles of Physical chemistry, Puri, Sharma and Pathania, Vishal Publishing Co. 2012 edition.
2. Textbook of physical chemistry, P.L. Soni, O.P. Dharmarha and U.N. Dash, Sultan Chand and sons, 2012 edition.
3. Essentials of physical chemistry, B.S.Bahl, Arun Bahl and G.D.Tuli, S. Chand and Company Pvt.Ltd.

V SEMESTER

Core Subject Paper –7

Part-III

| | | |
|----------|--|-------------------|
| 14UCHC53 | Inorganic Analytical and Applications of Computers in Chemistry | Hours 4/Credits 4 |
|----------|--|-------------------|

Unit - I**Inorganic Chemistry**

- Acids and bases - Arrhenius concept - Lowry Bronsted concept:- conjugate acid–base pairs, relative strength of acids and bases - Lewis concept - Levelling effect - hard and soft acids.
- Non aqueous solvents: Classification of solvents - Chemical reaction in liquid ammonia - Precipitation reaction - Acid –base reactions in liquid ammonia – Protolysis – Ammonolysis.

Unit - II**Bio-Inorganic Chemistry**

- Metallo porphyrins – Chlorophyll – structure and work function (photo system I & II) - Vitamin B₁₂ – structural features only.
- Myoglobin and hemoglobin – Structure - Their role in biological systems -Hill constant, cooperativity effect, Bohr effect - Explanation for cooperativity effect in hemoglobin.
- Role of Na⁺, K⁺, Ca²⁺ and Mg²⁺ ions in biological system.

Unit – III**Analytical Chemistry**

- Methods of obtaining the Precipitate – Condition – Choice of Precipitant – merits and demerits of Organic Precipitants – Types – Specific and selective precipitants Sequestering agents – theory of precipitation – Dendrites – Paneth – Fajans – Hahn law – Coprecipitation – post precipitation – precipitation from homogeneous solution.
- Precision – Accuracy – Absolute and relative error – Classification of errors – Confidence Limit – Students Q–test – Rejection of experimental data – Sources and elimination of errors – Significant figures and computation.

Unit – IV

Analysis of experimental results

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

Instrumental methods of Analysis

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

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

Unit – V

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

References:

1. R.Gopalan. P.S.Subramanian, K.Rengarajan. Elements of Analytical Chemistry.
2. K.V Raman. Computers in Chemistry.
3. E. Balagurusamy. Programming in ANSIC.

V SEMESTER

SKILL BASED SUBJECT – 5

Part-IV

| | | |
|----------|--|-------------------|
| 14UCHS51 | Pharmaceutical and Medicinal Chemistry | Hours 2/Credits 2 |
|----------|--|-------------------|

Unit-I

a. Introduction to the different systems of medicine

Ayurveda, siddha, Homeopathy & Allopathy - History of medicinal chemistry -Discovery of drugs- an introduction.

b. Analgesics and Antipyretics

Narcotic analgesics- Morphine and derivatives. Totally synthetic analgesics-pethidine and methadones. Antipyretic analgesics- Salicylic acid derivatives. Indole derivatives and p-amino phenol derivatives. (Medicinal uses & Structure only)

c. Diagnostic tests and estimation of sugar, Urea and cholesterol in serum, Urine, etc., Detection of pesticides and poisons- Antidotes for poisoning- First aid for poison by pesticides.

Unit- II**Chemotherapy and application of a few drugs (Elementary study)**

a. Sulpha drugs - Sulphadiazine, prontosil and prontosil-S

b. Antimalarials - Quinine and its derivatives

c. Arsenical drugs-Salvarasan-606- Neosalvarasan

d. Antibiotics: Definition, penicillin-Tetracyclin (Aurcomycin and Tetramycin)- Streptomycin and Chloromycetin - drug action and uses.

Unit- III**Hormones and Vitamins**

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

Unit- IV

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

Unit- V

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

Visit to an industry and submission of report. For industrial visit/Assignment=5 marks (Internal).

Contact District industrial centre (DIC for Visit).

References:

1. Clinical Bio-Chemistry - Varley, Sulthan Chan, 2005.
2. Text Book of Medical Laboratory Technology, Volumes, I, II &III by Muherji.

VI – SEMESTER

Core subject paper – 8

Part - III

| | | |
|----------|------------------------|-------------------|
| 14UCHC61 | Organic Chemistry – II | Hours 4/Credits 4 |
|----------|------------------------|-------------------|

Unit – I**Principles and Applications of Spectroscopy**

UV: Introduction: Types of electronic transition – absorption law – Beer-Lamberts law - bathochromic shift and hypsochromic shift – hyperchromic and hypochromic effect – applications of UV to organic compounds – Woodward-Fieser rule – calculation of λ_{\max} for dienes.

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

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

Simple Problems involving the applications of UV, IR and $^1\text{H}^1\text{NMR}$ spectroscopy.

Unit – II

Terpenes: Introduction, Classification. Occurrence and isolation – general properties – isoprene rule – general methods of determining structure – synthesis. Properties and structural elucidation of citral, geranial, terpeniol, menthol and camphor.

Proteins and Nucleic acids:

Definition – classification of proteins – colour reactions of proteins – primary. Secondary, tertiary and quaternary structure of proteins (An elementary idea only).

Nucleic acids – nucleosides – nucleotides – RNA and DNA (General structure).

Unit – III

Alicyclic compounds: General methods of preparation and properties of cycloparaffins – Baeyer's strain theory and its modification. Conformational analysis: Difference between configuration and conformation - Fischer, Sawhorse and Newman projection formulae – Conformational analysis of ethane, n-butane 1, 2 – dichloroethane, cyclohexane and monosubstitued cyclohexane. Civetone and Muscone: any one method of synthesis – Structure only (no Structural elucidation).

Unit – IV

Heterocyclic compounds: Synthesis and properties of pyrrole, pyridine, quinoline and isoquinoline.

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

Unit – V

Molecular rearrangements: Detailed mechanisms of the following: Pinacol – pinacolone, Hofmann, Curtius, benzyl – benzoic acid, Claisen, benzidine, Beckmann, Fries and Wagner – Meerwein rearrangements.

Free radicals: Definition – Preparation and reactions of short lived and long lived free radical – stability of free radicals- detection of free radicals – chain reaction- photochemical reactions of olefins, cis-trans isomerisation. Mechanism of Sandmeyer reaction, Gomberg reaction and Hofmann – Loeffler reaction.

References:

1. P. L. Soni and Chawla – Text book of Organic Chemistry (Sulthan Chand – 2012)
2. B. S. Bahl & Arun Bahl – Advanced Organic Chemistry (S. Chand & company Ltd. – 2009).
3. I.L. Finar – Organic Chemistry (Volume – II) – Pearson Education – VI Edition.
4. Y. R. Sharma – Elementary Organic Spectroscopy (S. Chand & Company Ltd. – 2009).

VI SEMESTER

Core subject paper - 9

Part - III

| | | |
|----------|------------------------|---------------------|
| 14UCHC62 | Physical Chemistry III | Hours 4 / Credits 4 |
|----------|------------------------|---------------------|

Unit -I**Electrochemistry-I**

Concepts of electrochemical cell – cell diagram and terminology – conventions regarding sign of cell e.m.f. – calculation of cell e.m.f. from single electrode potential – standard emf of the cell – Nernst equation derivation.

Reversible and irreversible cells – thermodynamics and electromotive force – calculation of ΔG , ΔH , ΔS and K for cell reaction.

Single electrode potential and cell emf measurement of single electrode potential – types of electrodes – reference electrodes – standard electrode potential – electrochemical series – experimental determination of cell emf – Weston cadmium cell.

Types of electrochemical cells

Chemicals cells with and without transference – examples – liquid junction potential – salt bridge. Concentration cells – definition – types of concentration cells – examples, emf of electrolyte concentration cells with and without transference.

Unit –II**Electrochemistry-II**

Commercial cells - primary and secondary cells – dry cell – lead storage cell – Ni-Cd cell – fuel cell – H_2O_2 cell - Applications of emf measurements - Determination of solubility and solubility products of sparingly soluble salt - Determination of pH using hydrogen electrode, glass electrode and quinhydrone electrode - Determination of transport number - Potentiometric titrations – acid, base, redox and precipitation titrations.

Unit – III

Photochemistry

Definition of photochemical reactions – comparative study of thermal and photochemical reactions – laws of photochemistry – Grotthus – Draper law – Stark – Einstein law – quantum efficiency and its determination – consequence of light absorption by atoms and molecules – photophysical processes – fluorescence, phosphorescence and other deactivating processes – Jablonski diagram - Photochemical processes – kinetics of photochemical reactions - Gaseous reactions : Hydrogen – halogen reactions (Formation of

HCl and HBr and decomposition of HI) - Photochemical equilibrium – flash photolysis – photosensitisation, chemiluminescence - bioluminescence.

Unit – IV

Group Theory

Molecular symmetry elements and symmetry operations – operations – products of symmetry operations – properties of a group – classes and sub groups – groups multiplication table – C_{2v} and C_{3v} – abelian and non-abelian groups - Point groups – classification of molecules into point groups – C_{2v} , C_{3v} , C_{2h} , D_{2h} , D_{3h} , D_{4h} , D_{6h} , T_d and O_h – Matrices - Representation of symmetry operations by matrices – C_{2v} . inverse matrix and transformation matrices.

Unit–V

Molecular Spectroscopy

Introduction – electromagnetic radiation – different regions – absorption spectroscopy – molecular spectra – types of molecular spectra.

Rotational spectra of diatomic molecules – rigid rotator – derivation for energy and frequency of transition - selection rule – determination of moment of inertia and bond length – intensities of spectral lines.

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

Raman spectra – Raman effect – stokes and anti stokes lines – comparison between IR and Raman spectra – applications of Raman spectra.

Electronic spectra – Franck – Condon principle, Born Oppenheimer approximation - types of transitions with examples.

References:

1. Principles of Physical chemistry, Puri, Sharma and Pathania, Vishal Publishing Co. 2012 edition.
2. Textbook of physical chemistry, P.L. Soni, O.P. Dharmarha and U.N. Dash., Sultan Chand and sons, 2012 edition.
3. Essentials of physical chemistry, B.S.Bahl, Arul Bahl and G.D.Tuli, S. Chand and Company Pvt.Ltd.
4. Group Theory in Chemistry, V. Ramakrishanan and M.S. Gopinathan, Vishal Publishing Co, 2012 edition.

VI SEMESTER

Core Subject Paper - 10

Part - III

| | | |
|----------|-------------------|-------------------|
| 14UCHC63 | Applied Chemistry | Hours 4/Credits 4 |
|----------|-------------------|-------------------|

Unit - I

Water quality analysis-Chemical and Physical Analysis of water – Water Quality parameters - Standards prescribed for water quality by WHO and other Indian standards. Sea water as a source of drinking water- Electro dialysis method and Reverse osmosis method for purifications of water.

Sewage Treatment: Municipal waste-Sewage Treatment-Aerobic and Anaerobic process- Miscellaneous method of sewage treatment

Unit-II

Rubber - Natural and synthetic rubbers-composition of natural rubber, Neoprene, Styrene-Butadiene rubber (SBR).

Polymer Chemistry - Types of polymerisation-Addition and condensation polymerization - Mechanism- Copolymer - Homopolymer -Definition of natural and synthetic fibres - natural and synthetic resins - Bakelite, Urea formaldehyde resins, Teflon, Nylon-66 and Dacron.

Oils and Fats - Saponification value, Iodine value, Reichert – Meissal value, Acid value, Definition and their determination – Applications – manufacture of soap – detergents – cleansing action of soap and detergents.

Insecticides and Pesticides - Definition-Classification-Inorganic pesticides: lead arsenate, Paris green, lime, sulphur, hydrocyanic acid –Organic pesticides, natural, synthetic (DDT, Gammaxene) –Fungicides -Repellants.

Preparation of domestically useful chemical products- washing powder-Cleaning powder-Phenoyls (white, black and coloured) Shampoo, Liquid blue, blue, Red and Green inks, soap oil, Face powder, pain balm.

Unit - III

a. Match industry - Pyrotechniques and explosives- Raw materials needed for the match industry –Manufacturing processes –Pyrotechniques - Coloured smokes.

b. Cement, Glass and ceramics –Raw materials and manufacture of cement –Glass and ceramics.

Unit-IV

- a. Petrochemicals - Elementary study -Definition –Origin- Composition -Chemicals from natural gas, Petroleum, Light Naphtha and Kerosene -Synthetic gasoline.
- b. Paints and lacquers – Pigments –Paints -Ingredients in paints -Manufacture –Lacquers- Varnishes.

Unit-V

Fertilizers: Definition-nutrients for plants - role of various elements in plants growth – natural and chemical fertilizers-classification of chemical fertilizers-urea super phosphate and potassium nitrate- mixed fertilizer -fertilizer industries in India.

References

1. J.Ghosh – Fundamental Concepts of Applied Chemistry.
2. B.K. Sharma – Industrial Chemistry.

VI SEMESTER

Skill Based Subject– 6

Part-IV

| | | |
|----------|---|-------------------|
| 14UCHS61 | Medical Laboratory Technology and Clinical Bio-Chemistry | Hours 2/Credits 2 |
|----------|---|-------------------|

Unit-I

Types of microorganisms, general characteristics of Bacteria, Fungi and Viruses, sterilization and disinfection. Types of stains and staining procedures.

Collection and preparation of samples, Typhoid test and Tuberculin test, VDRL, Pregnancy and HIV test. Blood collection, use of anti coagulants. Transportations of blood after collection, Rh and blood grouping.

Unit-II

Determination of Hemoglobin content, Total RBC, WBC and platelet count, ESR calculation of red blood cell - examination of Malaria parasites, Routine examination of urine.

Unit-III

Carbohydrates: Properties and General classification. Test for Glucose and other reducing sugar from urine and blood - Interpretation of results, Glucose tolerance test.

Unit-IV

Lipids: General properties, Functions and classification of lipids. Determination of total lipids, Triglycerides and cholesterol in blood.

Unit-V

Analytical BioChemistry: Principles of colorimetry, Flame photometry, Chromatography, Electrophoresis and Basic Immunochemical Techniques. Use of Microscope - Fundamentals of Automation in clinical laboratories.

(Visit to a Hospital Clinical Lab and submission of Report. For Report/Assignment=5 marks (Internal). Contact Govt Hospital for Visit)

References:

1. Clinical Biochemistry by Varely, Sultan Chand, 2005.
2. Text Book of Medical Laboratory Technology Vol. I, Vol. II and Vol. III by Muherji (2006) Sultan Chand.

SYLLABUS FOR B.SC., CHEMISTRY MAJOR PRACTICALS**PRACTICAL – I****INORGANIC SEMI MICRO QUALITATIVE ANALYSIS (14UCHC2P)****Duration of Examination: 3 hrs**

Analysis of a mixture containing two anions of which one is an interfering ion and other cations by semi-micro method.

- Anions** : Carbonate, sulphate, nitrate, fluoride, chloride, bromide, iodide, oxalate, borate, phosphate, arsenite, arsenate and chromate.
- Cations** : Lead, bismuth, copper, cadmium, antimony, iron (II & III), aluminium, chromium, zinc, manganese, cobalt, nickel, barium, strontium, calcium, magnesium and ammonium.

Distribution of Marks

(Max. marks – 100)

Int : 40

Performance in the class: 30 marks

Observation notebook : 10 marks

Total : 40 marks

Ext :60

Viva voce - 10 marks

Record Notebook - 10 marks

Four radicals with correct procedures (4 x 10) - 40 marks

TOTAL - 60 marks

PRACTICAL – II

VOLUMETRIC ANALYSIS (14UCHC4P)

A double titration involving the making up of the solution to be estimated and the preparation of a primary standard.

LIST OF EXPERIMENTS

I. ACIDIMETRY AND ALKALIMETRY

Estimation of Na_2CO_3

Estimation of NaOH / KOH

Estimation of oxalic acid

II. REDOX TITRATIONS

a. Permanganimetry

- 1) Estimation of ferrous ion
- 2) Estimation of oxalic acid
- 3) Estimation of calcium (direct method)

b. Dichrometry

- 1) Estimation of ferrous ion
- 2) Estimation of ferric ion using external indicator

III. IODOMETRY AND IODIMETRY

- 1) Estimation of potassium dichromate
- 2) Estimation of potassium permanganate
- 3) Estimation of copper
- 4) Estimation of arsenious oxide.

IV. ARGENTIMETRY

1) Estimation of potassium chloride.

Distribution of Marks (Max. marks – 100)

Duration of examination: 3hrs

Int : 40

Performance in the class: 30 marks

Observation notebook : 10 marks

Total : 40 marks

Ext :60

Viva voce - 10 marks

Record Notebook - 10 marks

Procedure writing - 10 marks

Volumetric estimation - 30 marks

TOTAL - 60 marks

[Error < 2% - 30 marks

2-3% - 25 marks

3-4% - 20 marks

3-5% - 15 marks

> 5% - 10 marks]

PRACTICAL – III

GRAVIMETRIC ANALYSIS AND ORGANIC PREPARATION (14UCHC6P)

I. GRAVIMETRIC ANALYSIS

1. Estimation of lead as lead chromate
2. Estimation of barium as barium chromate
3. Estimation of calcium as calcium oxalate monohydrate
4. Estimation of copper as cuprous thiocyanate
5. Estimation of nickel as NiDMG.

II. ORGANIC PREPARATION / SEPARATION

1. Nitration
 - a. m-dinitrobenzene from nitrobenzene
 - b. Picric acid from phenol
2. Bromination: p-bromoacetanilide from acetanilide
3. Hydrolysis: Aromatic acid from (a) an ester (b) an amide
4. Oxidation : Benzoic acid from benzaldehyde.
5. Benzoylation : (a) Amine (b) phenols
6. Acetylation : (a) Amine (b) phenols

Separation of mixtures

A mixture containing an acid or a base and a neutral compound (Acid or alkali separation).

Distribution of Marks

(Max. marks – 100)

Duration of examination: 6 hrs

Internal : 40 Marks

Performance in the class: 30 marks

Observation notebook : 10 marks

Total : 40 marks

External: 60 Marks

Record Notebook – 10 marks

Viva voce – 10 marks

Organic preparation (10 marks)

Procedure – 2 marks

Crude sample – 6 marks

Recrystallised sample – 2 marks

Gravimetric Estimation (30 marks)

Procedure – 10 marks

Estimation - 20 marks

[Error < 2% – 20 marks

2-3% – 18 marks

3-4% – 16 marks

4-5% – 14 marks

> 5% – 8 marks]

PRACTICAL – IV

ORGANIC ANALYSIS AND ESTIMATION (14UCHC6Q)

I. ORGANIC ANALYSIS

Analysis of an organic compound containing one or two functional groups and confirmation by the preparation of a solid derivative - acids, phenols, aldehydes, ketones, esters, nitro compounds, amines (primary, secondary and tertiary), amides, anilides, aliphatic diamide, side chain and nuclear halogen compounds, aliphatic diamide containing sulphur and monosaccharides.

II. ORGANIC ESTIMATION

- 1) Estimation of phenol
- 2) Estimation of aniline
- 3) Estimation of glucose.

Distribution of Marks (Max. marks – 100)

Duration of examination: 6 hrs

Int : 40

Performance in the class: 30 marks

Observation notebook : 10 marks

Total : 40 marks

Record Notebook – 10 marks Viva voce – 10 marks

Organic estimation

(20 marks)

Procedure – 5 marks

Estimation – 15 marks

[Error < 3% – 15 marks

3-4% – 13 marks

4-5% – 10 marks

> 5% – 8 marks]

Organic analysis

(20 marks)

Preliminary reaction – 2 marks

Elements present – 4 marks

Aliphatic or aromatic – 3 marks

Saturated / Unsaturated – 3 marks

Functional group – 6 marks

Derivative – 2 marks.

PRACTICAL – V

PHYSICAL CHEMISTRY EXPERIMENTS (14UCHC6R)

1. Determination of molecular weight by

- a. Transition temperature method – sodium thiosulphate pentahydrate, strontium chloride hexahydrate and sodium acetate trihydrate.
- b. Cryoscopic method – Rast method – camphor and naphthalene.

2. Phase diagram involving

- a. Simple eutectic and
- b. Compound formation

3. Critical solution temperature

Determination of CST of phenol – water system and effect of impurity on CST - strength of sodium chloride.

4. Thermo chemistry

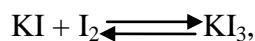
Heat of solution – potassium dichromate, ammonium oxalate and oxalic acid.

5. Viscosity

Determination of the composition of an unknown mixture.

6. Partition co-efficient experiments:

- a. (i) Study of the equilibrium constant for the reaction



by determining the partition co-efficient of iodine between water and carbon tetrachloride.

- (ii) Determination of strength of given KI

- b. Determination of association factor of benzoic acid in benzene.

7. Kinetics

Determination of relative strength of acids by

- a) Acid catalysed hydrolysis of ester.
- b) Inversion of cane sugar.

8. Electrochemistry

- a) Conductivity
- i) Determination of cell constant of the cell and equivalent conductance of solution.
 - ii) Conductivity titration between an acid and a base (HCl vs NaOH)
- b) Potentiometric titrations
1. KMnO_4 vs FeSO_4
 2. $\text{K}_2\text{Cr}_2\text{O}_7$ vs FeSO_4
 3. HCl vs NaOH.

Distribution of Marks (Max. marks – 100)

Duration of examination: 6 hrs

Int : 40

Performance in the class: 30 marks

Observation notebook : 10 marks

Total : 40 marks

Ext :60

| | | |
|----------------------------------|---|----------|
| Viva voce | - | 10 marks |
| Record Notebook | - | 10 marks |
| For completion of the experiment | - | 20 marks |
| Graph | - | 2 marks |
| Calculation | - | 5 marks |
| Tabulation | - | 3 marks |
| Result | - | 10 marks |

| | | |
|-------|---|---|
| TOTAL | - | <hr style="border: 0.5px solid black;"/> 60 marks |
|-------|---|---|

**B.Sc., Ancillary Chemistry Syllabus for Biochemistry, Microbiology,
Physics and Zoology with effect from 2014-2015 onwards**

| Year | Semester | Name of the Subject with Code | Hrs / week | Internal Marks | External Marks |
|----------|----------|--|------------|----------------|----------------|
| I / II | I / III | Ancillary Chemistry Paper-I (Organic, Inorganic and Physical chemistry) - 14UCHA11 | 4 | 25 | 75 |
| | II / IV | Ancillary Chemistry Paper-II (Organic and Physical Chemistry) - 14UCHA21 | 4 | 25 | 75 |
| | | Practical-I Volumetric Analysis - 14UCHA2P | 2 | 40 | 60 |
| II / III | III / V | Ancillary Chemistry Paper-III (Organic, Inorganic and Physical chemistry) - 14UCHA31 | 4 | 25 | 75 |
| | IV / VI | Ancillary chemistry paper-IV (Organic and Physical chemistry) - 14UCHA41 | 4 | 25 | 75 |
| | | Practical-II Organic Analysis - 14UCHA4P | 2 | 40 | 60 |

Ancillary Chemistry Syllabus

I SEMESTER

Part-III

| | | |
|----------|---|-------------------|
| 14UCHA11 | Ancillary Chemistry Paper -I (Organic, Inorganic And Physical Chemistry) | Hours 4/Credits 4 |
|----------|---|-------------------|

Unit – I

Hydrogen : Isotopes of hydrogen – preparation, properties and uses of heavy hydrogen – ortho and Para hydrogen – hydrides – definition – classification – examples.

Oxides – Definition – classification – examples.

Water: Hardness of water – types of hardness – removal of hardness – industrial implications of hardness in water – estimation by EDTA method (outline only) units of hardness of water.

Unit II

Detection of nitrogen and halogens in organic compounds – empirical formula – molecular formula – structural formula – simple calculation

Nature of valency of carbon in organic compounds – tetrahedral arrangement of valency of carbon - bond-breaking and bond forming in organic reactions – homolytic cleavage – heterolytic cleavage – reaction intermediates – formation, stability and reactions of carbo cation ion and free radicals.

Nucleophiles – Electrophiles: Definition, types and examples.

Type of reactions: substitution – addition – elimination – rearrangement and polymerization – illustration with examples.

Unit III

Gaseous state – Postulates of kinetic theory of gases – derivation of expression for pressure of an ideal gas on the basis of kinetic theory – deducing the basic gas laws.

Deviation of real gases from ideal behavior – reasons for deviation – Derivation of van der Waals gas equation – explanation of behavior of real gases on the basis of van der Waals gas equation - Liquefaction of gases – critical phenomenon – modern methods – Joule – Thomson effect – inversion temperature.

Unit IV

Bonding: V.B. Theory – postulates of V.B. theory – application to the formation of simple molecules like H_2 and O_2 – overlap of atomic orbitals – s-s, s-p and p-p overlap – principle of hybridization – sp, sp^2 and sp^3 hybridisation – VSEPR theory.

M.O. theory: Formation of M.O's – bonding and antibonding and non – bonding. M.O.'s – M.O. diagram for H_2 , He and F_2 .

Unit V

Colloids

Colloidal state of matter – various types – classification - Sols – dialysis – electro osmosis – electrophoresis – stability of colloids – protective action – Hardy Schulze law – gold number. Emulsion: Types of emulsions – emulsifier with examples - Gels: Classification, preparation - Applications of colloids.

References:

1. Essential of physical chemistry: Arun Bhal, B.S. Bhal, G.D. Tuli (revised edition, S.Chand, 2014).
2. Principles of physical chemistry: Puri, Sharma, Pathania (revised edition, Vishal pub., 2014)
3. Modern Inorganic chemistry: R.D. Madan (revised edition, S. Chand, 2013).
4. A Text book of Organic chemistry: Arun Bhal, B.S. Bhal (revised edition, S. Chand, 2014).

II SEMESTER

Part-III

| | | |
|----------|---|-------------------|
| 14UCHA41 | Ancillary Chemistry Paper- IV (Organic And Physical Chemistry) | Hours 4/Credits 4 |
|----------|---|-------------------|

Unit – I**NUCLEAR CHEMISTRY**

Composition of the nucleus – nuclear forces – mass defect – binding energy – nuclear stability.

Soddy's group displacement law – illustration – law of radioactive disintegration.

Nuclear fission: Definition – theories of fusion – application of fission – the principle of atom bomb.

Nuclear fusion: Definition – emission of energy – Stellar energy – hydrogen bomb.

Application of radioactivity– In medicine, agriculture, industry and analytical fields – carbon dating.

Unit – II

Carbohydrates: Definition – classification – monosaccharides – properties and uses of glucose and fructose – configuration of glucose – Haworth structure – conversion of glucose to fructose and vice versa, Anomers, epimers and epimerization.

Disaccharides: Sucrose – structure – distinction between sucrose, glucose and fructose.

Polysaccharides: Starch and cellulose (Structure only) α -amylose – amylopectin – difference between these two.

Unit – III

Stereoisomerism – chiral centre – optical activity of compounds containing one or two chiral centers – R-S notation – enantiomers – diastereoisomers – racemization – resolution.

Geometrical isomerism of maleic and fumaric acids. E-Z notation of geometrical isomers.

Unit – IV**Halogen Compounds**

Aromatic halogen compounds: Chlorobenzene, hexachlorobenzene – halogenation of toluene – preparation, properties and uses of benzoyl chloride, chlorotoluene – DDT – preparation and mode of application.

Mechanism of aliphatic substitution – S_N^1 , S_N^2 – illustration with examples – differences – Saytzeff – Hofmann rules.

Organometallic compounds: Definition – preparation – synthetic application of Grignard reagent.

Unit – V

Amino acids and proteins: Classification – synthesis – properties of amino acids – polypeptides – proteins – classification and biological functions.

Dyes : Definition – theory of colour and constitution – classification based on structure and applications – preparation of methyl orange – Bismark brown, malachite green – vat dye – indigo.

References:

1. Essential of physical chemistry: Arun Bhal, B.S. Bhal, G.D. Tuli (revised edition, S.Chand, 2014).
2. Principles of physical chemistry: Puri, Sharma, Pathania (revised edition, Vishal pub., 2014)
3. Modern Inorganic chemistry: R.D. Madan (revised edition, S. Chand, 2013).
4. A Text book of Organic chemistry: Arun Bhal, B.S. Bhal (revised edition, S. Chand, 2014).

III SEMESTER

PART –III

| | | |
|----------|--|-------------------|
| 14UCHA31 | Ancillary Chemistry Paper- III (Organic And Physical Chemistry) | Hours 4/Credits 4 |
|----------|--|-------------------|

Unit – I

Adsorption : Definition – difference between adsorption and absorption – adsorbate, adsorbent – physical adsorption – chemical adsorption – differences between these two types – factors influencing adsorption – adsorption isotherm – Freundlich isotherm- Langmuir isotherm - adsorption of gases on solid surface.

Unit – II

Catalysis : Definition – different types of catalysis – acid-base catalysis – surface catalytic reactions – definition and examples – autocatalyst – catalytic poisoning – promoters – enzyme catalysis – characteristics.

Polymers : Definition – classification of polymers – properties of polymers – addition and condensation polymerization reactions with examples – natural rubber – isoprene unit – vulcanization of rubber – preparation and application of polystyrene, urea – formaldehyde resin, Teflon and buna-S-rubber.

Unit – III

Photochemistry: Comparison of thermal and photochemical reactions – definition of photochemical reactions – laws of photochemistry – Grotthus – Draper law – Einstein law – quantum efficiency – reasons for low and high quantum yield with examples – consequence of light absorption by atoms and molecules – Jablonsky diagram – fluorescence – phosphorescence – photosensitization – chemiluminescence – bioluminescence – applications of photochemistry.

Unit – IV

Coordination compounds: Definition – nomenclature – definition of various terms involved in coordination chemistry – Werner's theory EAN rule – VB theory – Nickel carbonyl – chelates.

Unit V

Petrochemicals: crude oil- chemicals from crude oil- LPG-aviation fuel-fuels used in Locomotives, trucks, ships and light commercial vehicle-knocking- TEL-Octane number- Synthetic petrol.

References:

1. Essential of physical chemistry: Arun Bhal, B.S. Bhal, G.D. Tuli (revised edition, S.Chand, 2014).
2. Principles of physical chemistry: Puri, Sharma, Pathania (revised edition, Vishal pub., 2014)
3. Modern Inorganic chemistry: R.D. Madan (revised edition, S. Chand, 2013).
4. A Text book of Organic chemistry: Arun Bhal, B.S. Bhal (revised edition, S. Chand, 2014).

IV SEMESTER

Part-III

| | | |
|----------|---|-------------------|
| 14UCHA41 | Ancillary Chemistry Paper- IV (Organic And Physical Chemistry) | Hours 4/Credits 4 |
|----------|---|-------------------|

Unit – I

Heterocyclic compounds – preparation and reactions of pyrrole, furan, pyridine, quinoline, isoquinoline, (Structural elucidation & synthesis not necessary).

Unit II

Alkaloids – pharmacological properties and importance of the following alkaloids – nicotine, quinine, piperine and cocaine (Structural elucidation not necessary).

Vitamins and antibiotics

Classification and biological functions of vitamins A, B₆, B₁₂, C, D, E and K (Structural elucidation not required)

Classification and biological functions of antibiotics – penicillin, chloroamphenicol, streptomycin and tetracyclins.

Unit –III

Chemical kinetics: Reaction rate – order and molecularity of a reaction – zero order – first order. First order rate equation and half life period – derivation. Examples of first order reactions – second order reactions – examples. Carbon dating – enzyme catalysis – Michaelis and Menten mechanism – Line-weaver Burk plot – significance of K_m .

Unit – IV

Chromatographic technique: Principle and application – partition and gas Chromatography – thin layer chromatography – column chromatography – paper Chromatography – gas-solid and gas-liquid chromatography

Unit – V**Electro chemistry:**

P^H - Definition-simple calculation of P^H from Molarity of acids and bases-common ion effect- and its application in analytical chemistry-buffer solution-definition-theory of buffer action-application

Acid – base indicators-working range - commercial cells and batteries - primary and secondary cells-Weston – cadmium cell- lead storage cell-electroplating - principle and methods.

References:

1. Essential of physical chemistry: Arun Bhal, B.S. Bhal, G.D. Tuli (revised edition, S.Chand, 2014).
2. Principles of physical chemistry: Puri, Sharma, Pathania (revised edition, Vishal pub., 2014)
3. Modern Inorganic chemistry: R.D. Madan (revised edition, S. Chand, 2013).
4. A Text book of Organic chemistry: Arun Bhal, B.S. Bhal (revised edition, S. Chand, 2014).

SYLLABUS FOR ANCILLARY CHEMISTRY PRACTICALS**PRACTICAL I - VOLUMETRIC ANALYSIS**

| | | |
|-----------------|----------------------------|--------------------------|
| 14UCHA2P | VOLUMETRIC ANALYSIS | Hours 2/Credits 1 |
|-----------------|----------------------------|--------------------------|

A double titration involving making up of the solution to be estimated or single titration involving making up of the solution to be estimated and the preparation of a primary standard.

A. ACIDIMETRY AND ALKALIMETRY

1. Titrations between a strong acid and strong base.
2. Titrations between a strong acid and weak base.
3. Titrations between a weak acid and strong base.

B. PERMANGANIMETRY

1. Titrations between potassium permanganate and oxalic acid, ferrous sulphate and ferrous ammonium sulphate (Mohr's salt)

C. IODOMETRY (DEMONSTRATION ONLY)

1. Titrations of sodium thiosulphate with potassium permanganate and potassium dichromate.

Distribution of Marks

(Max. marks – 100) Duration of examination: 2 hrs

Int : 40

| | |
|--------------------------|------------|
| Attendance in the class: | 20 marks |
| Model test | : 10 marks |
| Observation notebook | : 10 marks |
| Total | : 40 marks |

Ext: 60

| | | |
|-----------------|-------|------------|
| Viva voce | - | 10 marks |
| Record Notebook | - | 10 marks |
| Procedure | - | 10 marks |
| Estimation | - | 30 marks |
| | | <hr/> |
| | Total | - 60 marks |
| | | <hr/> |
| [Errors | 2-3% | - 30 marks |
| | 3-4% | - 25 marks |
| | 4-5% | - 15 marks |
| | > 5% | - 10 marks |

PRACTICAL II - ORGANIC ANALYSIS

| | | |
|-----------------|-------------------------|--------------------------|
| 14UCHA4P | Organic Analysis | Hours 2/Credits 1 |
|-----------------|-------------------------|--------------------------|

ORGANIC ANALYSIS

Analysis of an organic compound containing one or two functional groups and confirmation by the preparation of a solid derivative / colour reactions - acids, phenols, aldehydes, esters, amines (primary, secondary and tertiary), amides, anilides, aliphatic diamide and monosaccharide.

Distribution of Marks

(Max. marks – 100) Duration of examination: 2 hrs

Int: 40

| | |
|--------------------------|-------------------|
| Attendance in the class: | 20 marks |
| Model test | : 10 marks |
| Observation notebook | : 10 marks |
| Total | : 40 marks |

Ext: 60

| | | |
|---|---|-----------------|
| Viva voce | - | 10 marks |
| Record Notebook | - | 10 marks |
| Preliminary reactions | - | 5 marks |
| Detection of element | - | 5 marks |
| Aliphatic / Aromatic | - | 5 marks |
| Saturated / Unsaturated | - | 5 marks |
| Detection of functional group with correct procedure | - | 15 marks |
| Derivative / Colour reaction | - | 5 marks |
| TOTAL | - | 60 marks |