VIVEKANANDA COLLEGE

College with Potential for Excellence
(Residential & Autonomous - A Gurkula Institute of Life-Training)
(Affiliated to Madurai Kamaraj University)
Re-accredited with ‘A’ Grade (CGPA 3.59 out of 4) by NAAC

TIRUVEDAKAM WEST
MADURAI DISTRICT – 625 234

POST GRADUATE AND RESEARCH
DEPARTMENT OF CHEMISTRY

B.Sc. CHEMISTRY
SYLLABUS

Choice Based Credit System

(For those who joined in June 2015 onwards)
ABOUT THE COLLEGE

Vivekananda College was started by Founder-President Swamiji Chidbhavanandhaji Maharaj of Sri Ramakrishna Tapovanam, Tirupparaithurai, Trichy in 1971 on the banks of the river Vaigai which is blissfully free from the noise and hurry, the crowds and distraction of the city.

Vivekananda College is a residential college functioning under Gurukula pattern. It is Man-making education that is imparted in this institution, Culture, character and curriculum are the three facets of ideal education that make man a better man. This is possible only when the teacher and taught live together, The Gurukula system of Training is therefore a humble and systematic attempt in reviving the age old GURUGRIHAVASA for wholesome education, Attention to physical culture, devotion to duty, obedience to teachers, hospitality to guests, zest for life, love for the nation, and above all, humility and faith in the presence of God etc. are the values sought to be inculcated. All steps are taken to ensure the required atmosphere for the ideal life training.

Vivekananda College, Tiruvedakam West, Madurai District-625 234 is an aided college established in 1971 and offers UG and PG courses. This College is affiliated to the Madurai Kamaraj University, Madurai. The College was reaccredited with ‘A’ grade (CGPA 3.59 out of 4.00) by NAAC in September 2015. The college was awarded College with Potential for Excellence by UGC in 2016.

VISION AND MISSION
Our Vision: To raise an army of neo-graduates steeped in the hoary culture of the motherland and dedicated to serving her as potential leaders in the manifold spheres of national effort.
Our Mission: A harmonious enrichment of physical, emotional and intellectual facets of a student’s personality to bring out his inherent PERFECTION.

OBJECTIVES OF THE INSTITUTION
1. To inculcate spiritual, ethical, moral and social values in all disciplines of study.
2. Simultaneous education of the Hand, Heart and Head. Only a sound body can hold a sound mind.
3. Provide opportunities for all round development of the students and excellence in higher education, research and extension in different disciplines.
4. Disseminate the findings of research to the community to facilitate its development.
5. To provide society citizens of sterling character.
6. To cater the needs of the educationally backward people – the most backward, scheduled caste and tribe.
GURUKULA ADMINISTRATIVE SET UP

Secretary
Swami Niyamananda Maharaj

Principal
Dr. B. Ramamoorthy

Vice-Principal & NAAC Coordinator
Dr. S. Raja

Dean & Controller of Examinations
Dr. E. Jayakumar

IQAC Coordinator
Dr. S. Raja

IGNOU Coordinator
Dr. N. Nagendran

ICT Coordinator
Dr. T. Kaliappan

Grievence Cell Coordinator
Sri. V. Parthasarathy

Sessional Examination Coordinator
Sri. P. Jeyasankar, HOD of Physics

Dr. N. Meenakshisundaram
Sri. S. Ganeshan
Sri. S. Kalimuthu

I. Eligibility For Admission

Admission to B.Sc. – Chemistry Programme is open to candidates with +2 pass with Maths, Physics, Chemistry, Biology, Botany and Zoology as main subjects.

For B.Sc.- Chemistry course offered in the college, a pass in the Higher Secondary Examination conducted by the Government of Tamil Nadu or an examination accepted as equivalent there to by the Syndicate of the MKU, subject to such conditions as may be prescribed therefore.

II. Duration

The course is for a period of three years. Each academic year shall comprise of two semesters viz. Odd and Even semesters. Odd semesters shall be from June to November and Even Semesters shall be from December to April. There shall be not less than 90 working days which shall comprise 450 teaching clock hours for each semester (Exclusive of the days for the conduct of university end-semester examinations) for each semester.

III. CBCS System

All Programmes offered in the college are run on Choice Based Credit System (CBCS). It is an instructional package developed to suit the needs of students to keep pace with developments in higher education and the quality assurance expected of it in the light of liberalization and globalization in higher education.

IV. Semesters

An academic year is divided into two semesters. In each semester, courses are offered in 15 teaching weeks. Each week has 30 working hours spread over 6 days a week.

V. Credits

The term 'Credit' refers to the weightage given to a course, usually in relation to the instructional hours assigned to it. The total minimum credits, required for completing the B.Sc. Programme is 140. The details of credits for individual components and individual courses are given in the above table.

VI. Course

Each Course is to be designed variously under lectures / laboratory / seminar / practical training / assignments to meet effective teaching and learning needs.
VII. Examinations
   i). There shall be examinations at the end of each semester, for odd semesters in the month of October / November; for even semesters in April/May. A candidate who does not pass the examination in any course(s) shall be permitted to appear in such failed course(s) in the subsequent examinations to be held in October / November or April/May.
   ii). A candidate should get registered for the first semester examination. If registration is not possible owing to shortage of attendance beyond condonation limit / regulations prescribed or belated joining or on medical grounds, the candidates are permitted to move to the next semester. Such candidates shall re-do the missed semester after the completion of the programme.

VIII. Condonation
   Students must have 75% of attendance in each paper for appearing the examination. Students who have 65% to 74% of attendance shall apply for condonation in the prescribed form with the prescribed fee. Students who have 50% to 64% of attendance shall apply for condonation in prescribed form with the prescribed fee along with the Medical Certificate. Students who have below 50% of attendance are not eligible to appear for the examination. They shall compensate the shortage after the completion of the programme.

IX. Question Paper Pattern
    Time: 3 Hours
    Maximum Marks: 75

    SECTION-A (10 X 1 =10 Marks)
    Answer All Questions
    (1-5) Multiple Choice
    (6-10) Short Answer Questions
    Two questions from each unit

    SECTION-B (5 X 7 = 35 Marks)
    Answer All Questions
    (11-15) Questions shall be in the format of either (a) or (b)
    One question from each unit

    SECTION-C (3 X 10 = 30 Marks)
    Answer any THREE Questions
    (16-20) One question from each unit.

X. Evaluation:
   Performance of the students are evaluated objectively. They will be assessed continuously through Internal Assessment System and finally through summative (end) semester examination. To assess internally, there will be three examinations conducted centrally with duration of two hours for each paper. In addition to continuous evaluation, the summative semester examination, which will be a written examination of three hours duration, would also form an integral component of the evaluation. Evaluation is done both internally and externally. The ratio of marks to be allotted to continuous internal assessment and to end semester examination is 25 : 75.
   The pattern of internal valuation shall be:
   Test: 20 Marks (the average of best two tests out of three tests)
   Assignment: 5 marks
   Total: 25 marks.

   In respect of practical papers, the ratio of marks to be allotted to internal assessment and to summative (end) semester examination is 40 : 60. The internal marks will be calculated on the basis of marks secured at the model examination and marks awarded for the preparation of practical note book. The external marks
will be calculated on the basis of the marks awarded by the internal examiner and the external examiner at the summative semester examination.

**XI. Passing Minimum**

There is no passing minimum for Internal Assessment. The passing minimum for external Examinations shall be 27 out of 75 marks and passing minimum for a paper is 40%.

**XII. Classification of Students**

Candidates who have secured not less than 40% of marks in each paper shall be declared to have passed in that paper. Candidates who obtain 40% and above but below 50% shall be declared to have passed in Third Class. Candidates who obtain 50% and above but below 60% of the aggregate marks in Part-III shall be declared to have passed in Second Class and those who obtain 60% of marks and above shall be placed in the First Class. Candidates who obtain 75% and above shall be declared to have passed in Distinction provided he has not reappeared for any paper during the course of the study.

**XIII. Failed Candidates**

A candidate who has arrears in any paper in a semester examination will be permitted to proceed to the next semester classes. A candidate who has arrears may appear again in these failed papers at the November/April examinations. The internal assessment marks already obtained by him shall be carried over for the subsequent appearance also.

**XIV. Improvement of Internal Marks**

The student desirous of improving the internal assessment marks may request the Head of the Department. After obtaining permission from the Staff Council Meeting by the Head, the student may write improvement examinations in consultation with the course teacher. The marks obtained (when it is more than the previous marks) will be submitted to the Controller of Examinations for further adoption.

**XV. Study Tour**

Students are expected to participate in the field visit and the study tours organized by the department. Though study tour/field trip carries no credit, it is compulsory for the students to attend whereby the students can get an opportunity to gain practical knowledge. As such, observational visit to selected social welfare organizations, industries, trade centres, exhibitions, places of historical importance and the like will be considered as extra-curricular activities.

**HISTORY OF THE POST GRADUATE AND RESEARCH DEPARTMENT OF CHEMISTRY**

The undergraduate Department of Chemistry was started in the year 1981 and elevated as Postgraduate department in the year 2003. From the year 2005 the department has become a full fledged research centre as approved by the Madurai Kamaraj University, Madurai. The department glorified its ventures by conducting 19 MTCs (Modern Trends in Chemistry) seminars/symposia, from 1993. In addition to the teaching activities, the department is known for its research works in thrust areas like Green Chemistry, Coordination Chemistry, Supramolecular Chemistry, Bioinorganic Chemistry, Corrosion Science and Photochemistry. There are four major research projects have completed one funded by CSIR and the other three supported by UGC. One minor project funded by UGC is being carried out.
We have endowed with the following state of the art instruments:

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<th>Name of Equipment</th>
<th>Model or Make</th>
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**FACULTY MEMBERS**

Sri. B. SERVARAMUTHU, M.Sc., NET.,
Assistant Professor of Chemistry (Deputed for Ph.D under FDP)

Sri. A. KANNAN, M.Sc., NET
Head i/c & Assistant Professor of Chemistry

Dr. M. GANAPATHI, M.Sc., M.Phil., B.Ed., Ph.D.,
Assistant Professor of Chemistry

Dr. G. RAJKUMAR, M.Sc., SET., NET., Ph.D.,
Assistant Professor of Chemistry

Dr. K. NAGARAJ, M.Sc., M.Phil., B.Ed., Ph.D., (FDP Substitute Teacher)
Assistant Professor of Chemistry

Sri. M. RAGU, M.Sc.,
Assistant Professor of Chemistry

Dr. D. THIRUPPATHI, M.S.c., M.Phil., Ph.D.,
Assistant Professor of Chemistry

Sri. G. BALAKRISHNAN, M.Sc., B.Ed.,
Assistant Professor of Chemistry
Statement of Vision
The Chemistry Department is dedicated to
- Provide a comprehensive, relevant curriculum to the students of chemistry department
- Produce knowledgeable graduates for careers in academia, industry and government,
- Conduct significant research in chemistry,
- Promote the collegial exchange of ideas, independent thought and the highest ethical standards.

Statement of Mission:
The mission of Department of Chemistry is to advance the chemical sciences through the education of students by providing them with quality classroom, research and service opportunities. With a high standard for excellence in all three areas the department will produce students who are knowledgeable in chemistry and can think critically.

In support of our mission the Chemistry Department faculty members strive to:
- Act as mentors to students through advising them in research.
- Teach students the value of cross-disciplinary thinking by providing them with educational and research opportunities between chemistry and other fields of study.
- Promote innovative curriculum development while exposing students to advanced instrumentation and technology.
- Foster multi-disciplinary curriculum development to provide students with a breadth of course options in Forensic Chemistry, Biochemistry, Natural Product Chemistry, Environmental Science, Polymer Science and Chemical Education.
- Encourage community engagement by providing students with service-learning and community-based research opportunities.
- Serve as good role models to students for safe and ethical professional behaviour.
- Encourage students to value diversity and to develop a global perspective through international experiences in chemistry.

Mission Statements:
The mission of the Department of Chemistry is to create and maintain programs of excellence in the areas of research, education and public outreach. Our goals are (1) continue to attract, develop and retain world-renowned faculty, (2) maintain state of the art research and teaching facilities, (3) recruit outstanding graduate students, (4) provide innovative, dedicated classroom instruction at both the graduate and undergraduate levels, and (5) communicate the excitement of chemistry to the public at large. To help us accomplish these goals we remain dedicated to a core set of values: excellence in teaching and research, respect for all members of the Department and University, diversity in our students, faculty and staff and service to the citizens of the world.
### SCHEME OF EXAMINATION
(For those who join in June 2015 and after)

#### FIRST SEMESTER

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#### SECOND SEMESTER

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Note: Practical Examinations – 07CP23 – 3 Hrs
## THIRD SEMESTER

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Note: Practical Examinations – 07CP33 – 3 Hrs

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Note: Practical Examinations – 07CP43 – 4 Hrs;
### FIFTH SEMESTER

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Note: Practical Examinations – 07CP54 – 6 Hrs; 07CP55 – 4 Hrs

### SIXTH SEMESTER

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Note: Practical Examinations – 07CP63 – 6 Hrs

TOTAL HOURS: 180
TOTAL CREDITS: 140
B.Sc. Chemistry CBCS Syllabus - SEMESTER I  
(For those who joined in June 2015 and after)  

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Objectives:

To enable the students

- To understand the structure of polyelectronic atoms
- To gain basic knowledge about quantum chemistry
- To familiar with fundamentals of periodic properties
- To gain basic knowledge of colloids
- To understand the theory of adsorption

UNIT I: ATOMIC STRUCTURE  
12 Hrs


UNIT II: BASIC QUANTUM MECHANICS  
12 Hrs


UNIT III: PERIODIC PROPERTIES AND CHEMICAL BONDING – I  
12 Hrs


UNIT IV: COLLOIDS  
12 Hrs

UNIT V: ADSORPTION AND CATALYSIS 12 Hrs


Catalysis: Definition- various types of classification – Characteristics of catalysis, theories of catalysis – Promoters and poisons, enzyme catalysis, acid-base catalysis and autocatalysis with suitable examples – Applications.

Text Books:


Reference Book:

B.Sc. Chemistry CBCS Syllabus - SEMESTER I  
(For those who joined in June 2015 and after)

PART III – Core Subject Theory – II

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Objectives:
To enable the students
- To know about the fundamental concept of organic chemistry.
- To understand the various types of reaction intermediates.
- To study the alkane, alkene and alkyne.
- To know about the chemistry of aromaticity and aromatic electrophilic substitution reaction.

UNIT I: NOMENCLATURE AND ISOMERISM  9 Hrs
Nomenclature – common and IUPAC system of naming-aliphatic and aromatic compounds (Definitions and examples only). Isomerism – Structural isomerism – Chain isomerism-position isomerism-functional isomerism- metamerism – tautomerism.

UNIT II: ELECTRON DISPLACEMENT EFFECTS  9 Hrs

UNIT III: ALKANE,ALKENE AND ALKYNE  9 Hrs

UNIT IV: AROMATICITY  9 Hrs
Aromaticity – modern theory of aromaticity – conditions for aromaticity – Huckel’s rule { (4n+2) rule } – resonance and resonance energy in benzene – Structure of benzene - preparation and properties of benzene.

UNIT V: AROMATIC ELECTROPHILIC SUBSTITUTION REACTIONS  9 Hrs

Text Book:

Reference Book:
B.Sc. Chemistry CBCS Syllabus - SEMESTER I
(For those who joined in June 2015 and after)

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**Objectives:**

To enable the students

- To acquire skill in semi-micro inorganic qualitative analysis

**Analysis of mixture containing two** cations and two anions of which one is an interfering ion using semi micro method.

**Cations:**

Lead, bismuth, copper, cadmium, antimony, iron (II & III), aluminium, zinc, manganese, cobalt, nickel, barium, strontium, calcium, magnesium and ammonium.

**Anions:**

Carbonate, sulphate, nitrate, chloride, bromide, fluoride, oxalate, borate, phosphate, arsenite, and arsenate.

(Summative practical examination: At the end of second semester)

**Text book:**

1. Dr. V. V. Ramanujam, Inorganic semimicro qualitative analysis, The National Publishing Company.

**Reference Book:**

B.Sc. Chemistry CBCS Syllabus - SEMESTER I
(For those who joined in June 2015 and after)

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**Subject Title:** Food Chemistry

**Objectives:**
- To enable the students
  - To know about the concept of food adulteration.
  - To understand the various types of food poison
  - To know about the food materials & their preservations

**UNIT I: INTRODUCTION TO FOOD SCIENCE**
6 Hrs
Food in relation to health – Functions of Food – Food groups – Nutritional deficiency – Cooking – Preliminary Preparations – Cooking methods – Microwave cooking

**UNIT II: FOOD ADULTERATION**
6 Hrs

**UNIT III: FOOD POISON**
6 Hrs

**UNIT IV: FOOD ADDITIVES**
6 Hrs

**UNIT V: FOOD TECHNOLOGY**
6 Hrs

**Text Book:**

**Reference Books:**
B.Sc. Chemistry CBCS Syllabus - SEMESTER II
(For those who joined in June 2015 and after)

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Objectives:
To enable the students
- To understand the theory of chemical bonding
- To know about the halogen derivatives of aliphatic halogen compound
- To gain basic knowledge about organometallic reagents
- To have basic idea of aromatic halogen compound

UNIT I: CHEMICAL BONDING –II
9 Hrs
VB theory - overlap of orbitals (s-s, s-p and p-p)-sigma and pi bonds – hybridisation – sp, sp² and sp³ hybridisation with suitable examples. MO theory – bonding – antibonding orbitals – Bond order – Bond strength – Application of MOT to molecules H₂, O₂ and N₂. VSEPR theory – Application to H₂O, NH₃, CH₄ molecules.

UNIT II: ALIPHATIC HALOGEN COMPOUNDS
9 Hrs
Preparation, properties and uses of – methyl chloride – chloroform-carbon tetrachloride – relative reactivity of alkyl halides – Reaction and Mechanism of SN1, SN2, E1 and E2 with reference to alkyl halides.

UNIT III: ALIPHATIC AND AROMATIC ALCOHOLS
9 Hrs
General methods of preparation and reactions of ethyl alcohol – Allyl alcohol-ethylene glycol-glycerol – Nitro glycerine – Methods of preparation and properties of benzyl alcohol

UNIT IV: ORGANOMETALLIC REAGENTS
9 Hrs
Organometallic reagents – preparations, properties and Synthetic applications Grignard reagent – preparations and Synthetic applications of Dialkyl Zinc – preparations, properties and uses of Tetra ethyl lead (TEL)

UNIT V: ALIPHATIC AND AROMATIC HALOGEN DERIVATIVES
9 Hrs
Preparation and properties of vinyl chloride, allyl iodide – preparation of Westron, Freon and chloroprene – preparations and properties of chlorobenzene, benzyl chloride.

Text Books:

Reference Books:
PART III – Core Subject Theory – IV

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Objectives:

To enable the students

- To understand the essentials of nuclear chemistry
- To have basic idea of solid state chemistry
- To gain basic knowledge about crystallographic systems
- To study in detail about liquid state & liquid crystals

UNIT I: NUCLEAR CHEMISTRY I 12 Hrs


UNIT II: NUCLEAR CHEMISTRY II 12 Hrs


UNIT III: SOLID STATE 12 Hrs


UNIT IV: CRYSTALLOGRAPHIC SYSTEMS 12 Hrs

Bravais lattices – Simple cubic, face centered cubic and body centered cubic – Applications of x-rays to the study of crystal structures – Bragg’s equation – Powder method – Rotating crystal method – Determination of interplanar distance and wavelength of x-rays.
UNIT V: TYPES OF CRYSTALS AND LIQUID STATE

12 Hrs


b) Vitreous state and liquid crystals – Types of liquid crystal and applications – Disorders in the liquid state.

Text Book:


Reference Book:

PART III – Core Subject Practical

Subject Title: Inorganic Qualitative Analysis

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Objectives:
- To enable the students
- To acquire skill in semi-micro inorganic qualitative analysis

Analysis of mixture containing two cations and two anions of which one is an interfering ion using semi micro method.

Cations:
- Lead, bismuth, copper, cadmium, antimony, iron (II & III), aluminium, zinc, manganese, cobalt, nickel, barium, strontium, calcium, magnesium and ammonium.

Anions:
- Carbonate, sulphate, nitrate, chloride, bromide, fluoride, oxalate, borate, phosphate, arsenite, and arsenate.

(Summative practical examination: At the end of second semester)

Text book:
1. Dr. V. V. Ramanujam, Inorganic semimicro qualitative analysis, The National Publishing Company.

Reference Book:
B.Sc. Chemistry CBCS Syllabus - SEMESTER II  
(For those who joined in June 2015 and after)

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Objectives:

To enable the students

- To know about the fundamental concepts of medicinal chemistry
- To understand the vaccine preventable diseases
- To know about the epidemic diseases

UNIT I: INTRODUCTION 6 Hrs


UNIT II: SCIENCE OF DRUGS 6 Hrs


UNIT III: VACCINES 6 Hrs

Introduction of Vaccination – Epidemiology, Clinical features, prevention and control of (i) Mumps (ii) Rubella and (iii) Hepatitis.

UNIT IV: EPIDEMIC DISEASES 6 Hrs

Epidemiology, clinical features, prevention and control of

(1) Typhoid (ii) Cholera and (iii) Meningococcal meningitis.

UNIT V: COMMON BODY AILMENTS 6 Hrs

Diabetes – Causes, hyper and hypoglycemic drugs – Blood pressure – Sistoliec & Diastolic Hypertensive drugs – Cardiovascular drugs.

Text Book:


Reference Books:

1. PGDMCH-4, Child health – Indira Gandhi National Open University School of Health Sciences.
Part-III - Core Subject Theory

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Objectives:

To enable the students

- To understand the principle of volumetric analysis
- To gain basic knowledge about metallurgy
- To know about the phenols and polynuclear compounds
- To learn the basic idea of aliphatic and aromatic aldehydes and ketones

UNIT I: PRINCIPLE OF VOLUMETRIC ANALYSIS 12 Hrs


UNIT II: METALLURGY 12 Hrs


UNIT III: PHENOLS AND POLYNUCLEAR COMPOUNDS 12 Hrs


UNIT IV: ETHERS, THIO ALCOHOLS AND THIO ETHERS 12 Hrs

UNITV: ALIPHATIC AND AROMATIC ALDEHYDES AND KETONES  12 Hrs
Mechanism for nucleophilic addition – reactivity of carbonyl group –
preparation and properties of acetaldehyde and ethyl methyl ketone – Importance of
flavouring agents – varetraldehyde.

UNSATURATED AND HYDROXYALDEHYDES AND KETONES
Acrolein – crotonaldehyde – preparation – hydroxy aldehydes and ketones –
glycolaldehyde, aldol and diacetone alcohol. Cinnamaldehyde and salicylaldehyde

AROMATIC ALDEHYDES AND KETONES
Preparations and properties of benzaldehyde, acetophenone, benzophenone and
quinines.

Text Books:
2. Advanced Organic Chemistry by Bahl & Arun Bahl, S.Chand & Company Ltd,

Reference Book:
**B.Sc. Chemistry CBCS Syllabus - SEMESTER III**
*(For those who joined in June 2015 and after)*

<table>
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**Objectives:**

To enable the students
- To have basic idea of gaseous state chemistry
- To gain basic knowledge in thermodynamics
- To understand the theory of chemical equilibrium

**UNIT I: GASEOUS STATE**

12 Hrs

Real and ideal gases (definition only) – Boyle’s law–Graham’s law of diffusion – Avagadro’s law – Gay Lussac’s law (statement only) – Postulates of kinetic theory of gases-derivation of PV=1/3 mnc², Maxwell – Boltzmann distribution law of molecular velocities – Classification and relation between different molecular velocities – Effect of temperature on distribution of molecular velocities and graphical representation. Molecular collision of gases and mean free path – Collision number – Collision diameter-compressibility factor for gases and determination of molecular diameter – van der Waals and London forces.

**UNIT II: THERMODYNAMICS-I**

First Law of Thermodynamics

12 Hrs

Definition of thermodynamic terms: system, surroundings – types of systems, intensive and extensive properties – State and path functions and their differentials – Thermodynamic process – Concept of heat and work.


**UNIT III: THERMODYNAMICS-II**

Second law of thermodynamics

12 Hrs

Need for the second law-different statements of the second law-Carnot cycle and efficiency-Carnot’s theorem. Thermodynamic scale of temperature. Entropy as state function – entropy as a function of pressure and volume – Entropy changes of an ideal gas – physical significances of entropy – Clausius inequality – entropy as criteria of spontaneity and equilibrium. Gibbs function (G) and Helmholtz function (H) as thermodynamics quantities. Gibbs-Helmholtz equation.
UNIT IV: THIRD LAW OF THERMODYNAMICS 12 Hrs


UNIT V: CHEMICAL EQUILIBRIUM 12 Hrs


Text Book:


Reference Book:

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

LIST OF EXPERIMENTS

I. ACIDIMETRY AND ALKALIMETRY

1. Estimation of Na₂CO₃
2. Estimation of NaOH / KOH
3. Estimation of H₂SO₄ / HCl.

II. REDOX TITRATIONS

a. Permanganimetry
   1) Estimation of ferrous ion
   2) Estimation of oxalic acid
b. Dichrometry
   1) Estimation of ferrous ion (FAS / FS)

III. IODOMETRY AND IODIMETRY

1) Estimation of potassium dichromate
2) Estimation of potassium permanganate

Reference Book:

B.Sc. Chemistry CBCS Syllabus - SEMESTER III
(For those who joined in June 2015 and after)

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Objectives:

To enable the students

- To have basic idea of protein and nucleic acids
- To understand the theory enzyme
- To gain basic knowledge in medicine

UNIT I: PROTEINS AND NUCLEIC ACIDS 6 Hrs


UNIT II: ENZYMES 6 Hrs

Nomenclature and classification of enzyme – Specificity – Enzyme action, Fischer – Lock and Key model.

UNIT III: ANAESTHETICS 6 Hrs

Definition – characteristics – Mode of action – Classification – Gaseous anaesthetics – Advantage and disadvantages of vinyl ether, cyclopropane, Halohydro carbon, chloroform – Haloethane, Trichloroethylene. Thiopental sodium Advantages and disadvantages of Cocaine and Benzocaine (Structure and therapeuetic use only).

UNIT IV: ANALGESIC, ANTIPYRETIC AND ANTI INFLAMMATORY AGENTS 6 Hrs


UNIT V: ANTISEPTICS AND DISINFECTANTS 6 Hrs


Reference Books:

UNIT 1: VEGETABLE FIBRES AND ANIMAL FIBRES 6 Hrs

Definition-classification of textile fibres – essential and desirable properties of textile fibres – Cotton fibre – Physical and chemical properties, Jute-Purification; physical and chemical properties of jute, silk and wool

UNIT 2: REGENERATED AND SYNTHETIC FIBRES 6 Hrs


UNIT 3: PREPARATORY PROCESS PRIOR TO DYING 6 Hrs


UNIT 4: PRINCIPLES OF BLEACHING 6 Hrs

Principles of wetting and mechanism of detergency- synthetic detergents- surface active agents- bleaching processes-bleaching agents – H₂O₂, NaOCl, bleaching powder and biobleaching and their properties – Bleaching of cotton, rayon, wool and synthetic fibres.

UNIT 5: PRINCIPLES OF DYEING 6 Hrs


Reference Books:

Objectives:

To enable the students
- To know about the Carboxylic acids
- To have basic idea of Carbohydrates
- To understand the theory of Physical properties
- To have gain knowledge about Distribution law

UNIT I: MONO CARBOXYLIC ACIDS 12 Hrs

Aliphatic acids: Preparation and properties of formic acid and acetic acid - structural effect on strength of carboxylic acids.


Hydroxy acids: General methods of preparation and properties of glycolic acid and lactic acid. Action of heat on α, β and γ hydroxy acids.

Amino acids: Preparation and properties of Glycine and Alanine.

Aromatic acids: Preparation and properties of benzoic acid-salicylic acid-anthranilic acid.

UNIT II: ALDEHYDIC AND KETONIC ACIDS 12 Hrs

Preparation and properties of glyoxalic acid and acetoacetic acid. Decarboxylation of keto acid-synthetic application of malonic ester, acetoacetic ester and benzene diazonium chloride

UNIT III: CARBOHYDRATES 12 Hrs


UNIT IV: PHYSICAL PROPERTIES AND CHEMICAL CONSTITUTION 12 Hrs

Surface Tension and Chemical Constitution-Use of Parachor in Elucidating Structure-Viscosity and Chemical Constitution-Dunstan Rule-Molar Viscosity-Rhecohohor-Dipole Moment-Determination of Dipole Moment-Dipole Moment and

UNIT V: DISTRIBUTION LAW


Text Books:


Reference Books:

Part III- Core Subject Theory

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**Objectives:**

To enable the students
- To have basic idea of silicates
- To familiar with basic concept of halogens
- To have gain about acid base concept
- To know about inorganic reagents and basic idea of electron deficient

**UNIT I: SILICONES AND SILICATES** 12 Hrs


**UNIT II: HALOGENS** 12 Hrs


**UNIT III: HARD AND SOFT ACIDS AND BASES (HSAB)** 12 Hrs


**Non-Aqueous Solvents:** Definition-types of non aqueues solvents - Physical properties of a non aqueous solvent, reaction in non-aqueous solvents with reference to liquid NH₃ and liquid SO₂.

**UNIT IV: INORGANIC REAGENTS** 12 Hrs


**UNIT V: ELECTRON DEFICIENT COMPOUNDS** 12 Hrs

Introduction – hydrides of Boron –general preparation and properties of boranes- Diboranes preparation and properties uses,structure and bonding in higher
boranes Tetra boranes – penta borane 9 –penta borane -11 hexaborane -10, decaborane 14, and Wades rule.

**Text Books:**

2. Selected topics in Inorganic Chemistry by Malik, Tuli, and Madan, Sultan Chand & Sons, New Delhi, First Edition - 2006

**Reference Books:**

2. Text book of Modern inorganic chemistry Dr.R.D. Madan, Sultan Chand & Sons, New Delhi, Third edition -2011
B.Sc. Chemistry CBCS Syllabus - SEMESTER IV
(For those who joined in June 2015 and after)

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**Objectives:**
- *To enable the students*
- *To apply theoretical knowledge to laboratory work*
- *To develop skill in volumetric analysis*

**ORGANIC PREPARATION**

1. Nitration
   a) Picric acid from phenol
   b) Dinitro benzene from nitrobenzene

2. Bromination: p-bromoacetanilide from acetanilide

3. Hydrolysis: Benzoic acid from ethyl benzoate (or) benzamide

4. Acetylation / Benzoylation  
   a) Acetanilide from aniline  
   b) benzanilide from aniline

5. Oxidation: Benzoic acid from benzaldehyde

6. Glucosazone from glucose

**ORGANIC ESTIMATION**

1. Estimation of Phenol (Bromination method)
2. Estimation of aniline (Bromination method)

**Reference Book:**

B.Sc. Chemistry CBCS Syllabus - SEMESTER IV
(For those who joined in June 2015 and after)

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Objectives:
To enable the students
- To have basic idea of chemistry in action
- To understand the theory electron microscopy
- To gain basic knowledge in Petroleum

UNIT I:
Primordial Helium and the Big Bang Theory – The importance of units – Distribution of elements on Earth and in living System – Chemical fertilizers – An undesirable precipitation reaction – Breathlyzer – metal from the sea – Scuba diving and the Gas laws – Super cold atoms – Making snow and inflating a Bicycle Tire

UNIT II:

UNIT III:

UNIT IV:
The thermodynamics of a rubber band – Bacteria power – Dental filling Discomfort – Recycling Aluminium – Metallic hydrogen – Synthetic gas from coal – Ammonium nitrate – The explosive fertilizer – Coordination compounds the living systems – Cisplatin – the anticancer drug – Nature’s Own fission reactor

UNIT V:

Reference Book:
B.Sc. Chemistry CBCS Syllabus - SEMESTER IV
(For those who joined in June 2015 and after)

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Subject Title: Agricultural Chemistry

UNIT I: ORIGIN OF SOIL  (6 Hrs)

UNIT 2: PHYSICAL PROPERTIES OF SOIL  (6 Hrs)
Physical properties of soil-soil texture and textural classification- pore space- bulk density, particle density- soil structure and soil colour –surface area-soil colloids. Soil reaction- Ion exchange reaction – cation exchange-anion exchange –Buffering capacity- hydrogen ion concentration- determination of pH values- Factors affecting soil pH.

UNIT 3: CHEMISTRY ASPECTS OF SOIL  (6 Hrs)

UNIT 4: PLANT NUTRIENTS  (6 Hrs)

UNIT 5: PESTICIDES, FUNGICIDES AND HERBICIDES  (6 Hrs)

Reference Book:
PART- III : Core Based Subject

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<td>Summative Marks : 75</td>
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Objectives:

To enable the students

- To know about the Carboxylic acids
- To have basic idea of nitrogen compounds
- To predict the conformer of acyclic and cyclic compounds
- To have gain about stereochemistry

UNIT I: CARBOXYLIC ACID AND ITS DERIVATIVES 12 Hrs

Aliphatic dicarboxylic acids: Preparation and properties of malonic acid-Succinic acid and Adipic acid.

Unsaturated dicarboxylic acid: Preparation and properties of maleic and fumaric acids – Geometrical isomerism exhibited by maleic and fumaric acid.

Hydroxy acids: Preparation and properties of tartaric acid-optical isomerism exhibited by tartaric acid.

Aromatic dicarboxylic acids: Preparation and properties of phthalic acid and its derivatives – Phthalic anhydride and phthalimides.

UNIT II: NITROGEN CONTAINING COMPOUNDS-I 12 Hrs

Aliphatic nitrogen compounds: General methods of preparation and properties of methyl cyanide and isocyanides-distinction between cyanide and isocyanide – Tautomerism by nitro compounds.


UNIT III: NITROGEN CONTAINING COMPOUNDS-II 12 Hrs

Aliphatic diazo compounds: Preparation, properties and structure of diazomethane and diazoacetic ester.

Aromatic nitrogen compounds: Preparation and properties of nitrobenzene. Reduction of aromatic nitro compounds. Preparation and properties of aromatic amino compounds aniline and toluidines.
UNIT IV: ACYCLIC AND CYCLOALKANES 12 Hrs

Conformational study of ethane, n-butane and 1,2-dichloroethane - Relative stability of cycloalkanes from cyclopropane up to cyclooctane - Bayer's Strain theory – limitations and its modification. Conformation analysis of cyclohexane, cyclohexanone and decalins

UNIT V: STEREOCHEMISTRY 12 Hrs


Text Book:


Reference Books:

PART- III : Core Based Subject

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Objectives:

To enable the students

- To understand the basic concept of coordination chemistry
- To know about the Analytical chemistry
- To gain basic knowledge about Bio-inorganic chemistry

UNIT I: CO-ORDINATION CHEMISTRY – I  

15Hrs


UNIT II: COORDINATION CHEMISTRY – II  

15 Hrs


UNIT III: COORDINATION CHEMISTRY – III  

15 Hrs

Labile and inert complexes – Crystal field effects on substitution reaction rates. Substitution reaction of Cobalt (III) and platinum complexes – Trans effect. Mechanism – associative, dissociative - conjugate base. Inner sphere and outer sphere electron transfer reactions

UNIT IV: ERROR ANALYSIS AND THEORY OF ANALYTICAL CHEMISTRY  

15 Hrs

UNIT V: BIOINORGANIC CHEMISTRY

Introduction – essential and trace elements in biological systems —function and toxicity of the following elements in biological system — F, Na, Al, Mg, Cl, K, Ca, Cr, Mn, Cu, Zn, Ni, Co, As, Mo, Cd, Sn, Hg, and Pb. Problems in biological systems – Agriculture – biochemistry of iron- Haemoglobin and Myoglobin as oxygen carriers – Metals in medicine – metals used in diagnosis and chemotherapy with particular reference to anticancer drugs.

Text Books:

2. Selected topics in Inorganic Chemistry by Malik, Tuli, and Madan, Sultan Chand & Sons, New Delhi, First Edition- 2006

Reference Books:

Objectives:

To enable the students

- To understand the basic concept of Electrochemistry
- To gain basic knowledge about Photochemistry
- To gain basic knowledge of Phase rule

UNIT I: ELECTRICAL CONDUCTANCE 15 Hrs


UNIT II: ELECTROCHEMICAL CELLS 15 Hrs

Electro chemical series – single electrodes and electrode potentials – oxidation and reduction potentials. Thermodynamics and electromotive forces: Relation between chemical and electrical energies – calculation of different values of ΔG – Calculation of emf – Nernst equations for both oxidation and reduction-standard electrode potential and its characteristics – Types of electrodes: i) metal-metal ion ii) Gas iii) metal-insoluble salt iv) redox and vi) glass electrode. Electrochemical cells: i) chemical (or) voltaic cells-definition – Cell reaction and representation of electrodes and cells, emf of cells – conventions regarding signs of emf calculations of cell emf with the aid of Nernst equation – Experimental determination of emf of cells. Measurements of single electrode potentials – Calculations of ΔG, ΔH, ΔS and equilibrium constant from emf data-concentration cells. Liquid junction potential and salt bridge.

UNIT III: APPLICATIONS OF EMF MEASUREMENTS 15 Hrs

Determination of solubility product of a sparingly soluble salts ii) determination of pH using hydrogen electrode, glass electrode, calomel electrode
and quinhydrone electrode iii) determination of degree of hydrolysis iv) determination of valency of the ion v) potentiometric titrations-acid-base, redox, precipitation titrations vi) determination of transport number. Commercial cells-primary and secondary cells-Westron-cadmium cell and lead storage cells-over voltage, decomposition potential-hydrogen over voltage-theories of electrolyte-separation of metals-electrochemical principle of corrosion and passivity. Elementary idea of polorography.

UNIT IV: PHOTOCHEMISTRY 15 Hrs


UNIT V: PHASE RULE 15 Hrs

Statement and significance of the terms involved. Thermodynamic derivation of phase rule-comparison between the law of mass action and phase rule. Phase diagrams of one component and two component systems – phase diagrams of water, sulphur systems – Pb-Ag, KI/H₂O systems – Salt hydrate and freezing mixtures – Gas solid equilibria – Three component systems-partially miscible liquid pairs-two solid & one liquid systems.

Text Books:

Reference Book
PART- III : Core Subject Practical

Subject Title : Gravimetric Estimations

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Sessional Marks : 40 Summative Marks: 60 Total Marks: 100

Objectives:

To enable the students

❖ To develop skill in 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.

Reference Book:


PART- III : Core Subject

Subject Title : Organic Analysis

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Sessional Marks : 40 Summative Marks: 60 Total Marks: 100

Objectives:

To enable the students

❖ To carry out the analysis of given organic compounds

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

Reference Book:

PART- III : Elective Subject

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Objectives:

To enable the students

◆ To gain basic knowledge about computer application in chemistry
◆ To understand the basic concept of Green Chemistry

UNIT I

15 Hrs

UNIT II

15 Hrs
Memory unit – types of memory – Hardware – Software – Algorithm – Flowchart – Programming languages – Number system – Decimal – Binary system – Octal number system

UNIT III

15 Hrs
Salient features of windows and MS word for typing texts and equation in Chemistry – Tabular columns – Advanced concepts. Basic concept of creating and accessing databases using MS access – Significance of chemdraw – Drawing chemical structure and pasting them in the text.

UNIT IV

15 Hrs

UNIT V

15 Hrs

Text Books:

2. Green Chemistry - Rashmi Sanghi & MM Srivastava, Narosa publishing House 2003

Reference Books:

DRUG CHEMISTRY

UNIT: 1 Drugs and the medicinal chemist the why and the wherefore: drug targets: why should drug work? Where do drugs work- cell structure-drug targets at the molecular level- Intermolecular bonding forces- Electrostatic and ionic bonds-hydrogen bonds-Van der waals interactions- Dipole-dipole interactions-Reppulsive interaction-role of water and hydrophopic interactions- Drug targets: Lipids as drug targets-carbohydrates as drug targets.proteins and nucleic acid as drug targets.


UNIT: 4 Synthetic Narcotics: Analgesia and Addiction – A Natural High: The Brain’s Own Opiates – Some Chemistry of the Nervous System – Brain Amines: Depression and Mania – Antianxiety Agents – Stimulant Drugs: Amphetamines

UNIT: 5 The “Mindbenders”: LSD – Marijuana: Some Chemistry of Cannabis – Drugs and Deception: Chemistry and Quality Control – The Placebo Effect

Reference Book:

UNIT I: INTRODUCTION TO POLYMERS
Chemistry of polymerization: Free radical, ionic, coordination step polymerization. Polyaddition and polycondensation miscellaneous ring-opening & group transfer polymerizations.

UNIT II: PHYSICAL PROPERTIES AND REACTIONS OF POLYMERS
Properties: Glass transition temperature (Tg) - Definition – Factors affecting Tg-relationships between Tg and molecular weight and melting point. Importance of Tg. Molecular weight of polymers: Number average, weight average, sedimentation and viscosity average molecular weights. Molecular weights and degree of polymerisation. Reactions: hydrolysis – hydrogenation – addition – substitutions-cross-linking vulcanization and cyclisations reactions. Polymer degradation: Basic idea of thermal, photo and oxidative degradations of polymers.

UNIT III: POLYMERIZATION TECHNIQUES AND PROCESSING
Polymerisation techniques: Bulk, solution, suspension, emulsion, melt condensation and interfacial polycondensation polymerizations. Polymer processing: Calendering – die casting, rotational casting – compressing, injection moulding.

UNIT IV: CHEMISTRY OF COMMERCIAL POLYMERS
General methods of preparation, properties and uses of the following Polymers: Teflon, Polymethylmethacrylate. Polystyrene, PAN, polyesters, polycarbonates, Polyimides, (Kevlar), polyurethanes, PVC, epoxy resins, Rubber-styrene and neoprene rubbers, Phenol-formaldehydes and urea-formaldehyde resins.

UNIT V: ADVANCES IN POLYMERS

Reference Books:
B.Sc. Chemistry CBCS Syllabus - SEMESTER V  
(For those who joined in June 2015 and after)

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**Objectives:**

To enable the students

❖ To develop skill in industrial chemistry preparations

List of Experiments

1. Preparation of Cleaning Powder
2. Preparation of Mixed Fruit Jam
3. Preparation of Washing Powder
4. Preparation of Fountain Pen Ink
5. Preparation of Liquid Blue
6. Preparation of Syrup
7. Preparation of White Phenyl
8. Preparation of Black Phenyl
9. Preparation of Lipstick
10. Preparation of Nail polish
11. Preparation of Shampoo

*Study material will be provided

**Clinical Chemistry**

Objectives:

To enable the students

❖ To learn about the basic clinical chemistry

**Urine Analysis:**

1. Detection of bile pigment in urine (method1)
2. Detection of bile pigment in urine (method 2)
3. Detection of sugar in urine
4. Detection of albumin in urine
5. Detection of bile salt in urine

Interpretation of clinical laboratory reports

**Blood Analysis:**

Testing of blood groups and Rh factor.
Blood pH- Blood Sugar- Blood Urea – Blood Cholesterol-
Determination of hemoglobin content, total RBC, WBC, and platelet count,
ESR calculation RBC-examination of malaria parasite

**Lipids:** Determination of total lipids HDL & LDL-definition

*Study material will be provided
### B.Sc. Chemistry CBCS Syllabus - SEMESTER – V

(For those who joined in June 2015 and after)

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<td>Summative Marks: <strong>75</strong></td>
<td>Total Marks: <strong>100</strong></td>
</tr>
</tbody>
</table>

2hrs/week 24hrs

**Objectives**
- Disseminate information of Environment of national and international issues
- Environmental consciousness creation among the students
- Facilitation of environmental leadership among students

**Unit-I**

Introduction – Nature, scope and importance of Environmental studies – Natural Resources and conservation – forest, water and energy.

**Unit-II**

Ecosystem – concept – structure and function, energy flow, food chain, food web and ecological pyramids

**Unit-III**

Biodiversity – definition, types – values – India, a mega diversity zone – Hotspots – Endangered and endemic species – threat to biodiversity and conservation

**Unit-IV**


**Unit-V**


**Text book:**
- Environment studies – R.Murugesan (2009), Milleneum Pub. Madurai-16
B.Sc. Chemistry CBCS Syllabus - SEMESTER VI
(For those who joined in June 2015 and after)

PART – III : Core Subject Theory
Subject Title : Organic Chemistry-III

<table>
<thead>
<tr>
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<th>Hours per week : 5</th>
<th>Credit : 4</th>
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<tr>
<td>Sessional Marks : 25</td>
<td>Summative Marks: 75</td>
<td>Total Marks: 100</td>
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</tbody>
</table>

Objectives:
To enable the students
- To know about the polymers
- To have basic idea on dyes
- To basic knowledge of Heterocyclic compounds
- To have gain about vitamins
- To familiarise with fundamental concept of Spectroscopy

UNIT I: POLYMERS

Polymers – Definition – Classification of polymerization reactions – Addition and condensation polymerization reactions – Types of polymers – Mechanism of cationic, anionic and free radical polymerization – Thermo and thermo setting polymers - Preparation of caprolactam, Nylon 66, Polyester, epoxide resin – Biomedical applications of polymers (elementary treatment) – Natural rubber and synthetic rubber – Properties of polymers – Conducting polymers (a brief study).

UNIT II: DYES AND MOLECULAR REARRANGEMENT

Dyes - Theory of color and constitution - Chromophore, auxochrome – Classification according to application and structure – Preparation and uses of azo dyes, methyl orange, malachite green and indigo dyes – Indigotin, anthraquinone dyes – Alizarin, phthalein dyes – Fluorescein. Detailed mechanism of the following rearrangements: Wagner – Meerwin, Hofmann, Curtius, Beckman, Benzilic acid, Claisen, Benzidine, Fries and Orton rearrangements.

UNIT III: HETERO CYCLIC COMPOUNDS AND ALKALOIDS

Heterocyclic compounds: Single ring heterocyclics – Nomenclature, preparation and properties of pyrrole, furan, thiophene and pyridine – Condensed ring heterocycles – Nomenclature, preparation and properties of indole, quinoline and isoquinoline

Alkaloids: Definition, occurrence, extraction of alkaloids isolation – Properties and elucidation of structure and synthesis of coniine, piperine.
UNIT IV: TERPENES, VITAMINS, HORMONES AND CHEMOTHERAPY  15 Hrs

**Terpenes:** Introduction, classification, occurrence, Isolation and general properties – Isoprene rule – Synthesis of citral, properties and structure of geraniol, limonene, menthol and camphor.

**Vitamins and Hormones:** Definition, classification and importance of thyroxine, ascorbic acid, thiamine, testosterone and progesterone (Structural elucidation & synthesis not required).

**Chemotherapy:** Definition, preparations and application of the following drugs: Sulpha drugs, sulphanilamide, sulphapyridine and sulphathiazole.

UNIT V: UV -VISIBLE IR AND NMR SPECTROSCOPY  15Hrs

**UV-visible spectroscopy:** Introduction, electronic transition, effect of conjugation, concept of chromophore and auxochrome, bathochromic, hypsochromic, hyperchromic and hypochromic shifts. UV-vis spectra of conjugated dienes and solvent effect. Colour and light absorption.

**IR Spectroscopy:** Molecular vibrations – Finger print region-Identification of functional groups and interpretation of IR spectra – Simple problems involving UV and IR data.

**NMR Spectroscopy:** NMR phenomenon – chemical shift – factors influencing chemical shift (electro negativity, anisotropic effect), spin-spin coupling – application of NMR to simple molecules like ethyl alcohol, ethyl bromide, acetaldehyde, 1,1,2-tribromoethane and toluene.

**Text Book:**


**Reference Book**

B.Sc. Chemistry CBCS Syllabus - SEMESTER VI
(For those who joined in June 2015 and after)

<table>
<thead>
<tr>
<th>PART – IV Core Subject Theory</th>
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<td>Subject Title : Physical Chemistry - IV</td>
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Sessional Marks : 25  Summative Marks: 75  Total Marks: 100

Objectives:
To enable the students:
- To have basic concept of chemical kinetics
- To understand the concept of Group theory
- To familiar with fundamental concept of Spectroscopy

UNIT I: CHEMICAL KINETICS  15 Hrs

UNIT II: GROUP THEORY  15 Hrs

UNIT III: MOLECULAR SPECTROSCOPY  15Hrs

UNIT IV: IR SPECTROSCOPY  15 Hrs
Vibrational spectra – IR spectra of diatomic molecule – Rotation vibration spectra of diatomic molecule – applications of IR spectroscopy. Raman spectra – Comparison of Raman and IR spectra.
UNIT V: NMR, ESR AND MASS SPECTROSCOPY  15 Hrs

**Nuclear magnetic reasonance spectroscopy**: Chemical shift – Spin-spin coupling – Spectra of ethanol.

**Electron Spin resonance spectroscopy**: Principle of hyperfine splitting – ESR spectra of hydrogen and methyl radical.

**An introduction to mass spectroscopy**: Parent peaks – Base peaks – Isotopic peaks – Metastable peaks – Fragmentations – Nitrogen rule and Mclafferty rearrangement.

**Text Books:**


**Reference Books:**

PHYSICAL CHEMISTRY EXPERIMENTS:

I. Determination of Molecular weight by
   a) Transition Temperature method [Na$_2$S$_2$O$_3$, 5H$_2$O]. b) Rast Macro method – Naphthalene as Solvent

II. Phase diagram involving
   a) Simple eutectic   b) Compound formation

III. Critical solution temperature (CST)
   Determination of CST of phenol – water system and effect of impurity on CST – Determination of Strength of NaCl.

IV. Thermo Chemistry
   Heat of solution – K$_2$Cr$_2$O$_7$, (NH$_4$)$_2$ C$_2$O$_4$ and H$_2$C$_2$O$_4$.

V. Partition Co-efficient experiments:
   a) Study of the equilibrium constant for the reaction
      \[ \text{KI} + \text{I}_2 \leftrightarrow \text{KI}_3 \]
   By determining the partition Co-efficient of I$_2$ between water an CCl$_4$
   Determination of strength of given KI.

VI. Kinetics  Determination of relative strength of acids by hydrolysis of ester.

VII. Conductivity Determination of cell constant and conductivity titration between
     as acid and a base (HCl Vs NaOH)

Reference Book:
1. A.O.Thomas and Mani Text Book of Practical Physical Chemistry Scientific
Objectives:

To enable the students
- To know about the nanochemistry
- To study about the nanobiology and nano sensor

UNIT I: INVESTIGATING AND MANIPULATING MATERIALS IN THE NANOSCALE 15 Hrs

Introduction – difference between nanotechnology and biology – electronic microscopies – scanning electron microscopy (SEM) - TEM.

UNIT II: SEMICONDUCTORS QUANTUM DOTS 15 Hrs


UNIT III: NANOBIOLOGY 15 Hrs


UNIT IV: NANOSENSORS 15 Hrs


UNIT V: NANOMEDICINE 15 Hrs


Text Book:


Reference Book:

Objectives:

To enable the students

➢ To recall basic/advanced chemistry to prepare for Entrance examination for higher studies

➢ To develop aptitude, mental ability and reasoning ability in order to prepare for various competitive exams like TNPSC and banking sector etc.

➢ To prepare for state level and national level competitive exams

UNIT 1: CHEMISTRY-I

Introduction – Branches of chemistry – The Importance of Chemistry

Matter and its nature – Classification – Composition of Earth – Elements – Compounds – Some important elements and compounds – Mixtures – Avogadro’s Hypothesis and mole concept.

Chemical Reactions and the chemical equations – Balancing chemical equations – Rate of reaction – Energy changes in reactions.


Periodic Table of Elements – Periodic trends in properties.

Chemical Bonding – Electrovalent (Ionic) bond – Covalent (Chemical) bond – Shapes of Molecules – Theories of Chemical Bonding.

Oxygen and Air – Composition of Air – Air and Life – Respirations (Inhaled and Exhaled Air).


UNIT 2: CHEMISTRY-II

**Acids, Bases and Salts** – Acids – Bases – Theories of Acids and Bases – Salts – pH.

**Occurrence of Metals** – Properties of Metals – Extractions of Metals.

**Petroleum and Natural Gas** – Uses of various Fractions – Other Fractions.

**Iron and Steel** – Rusting of Iron – Cement and Glass.

**Colloids, Micelles and Nanotechnology** – Colloids and Colloidal State – Micelles-Associated Colloids – Emulsions – Gels – Applications of Colloids – Advanced Materials, Nanoscience and Nanotechnology.

**Agricultural Chemistry** – Chemical Control – Fertilisers.

**Medicinal Chemistry** – Diseases – Drugs – Common Drugs – Radiopharmaceuticals.

**Food Chemistry** – Food additives.

**Biochemistry and Life Processes** – Chemical Basis of Life – Biological role of Sodium, Potassium, Magnesium and Calcium – Buffers.


**Electrochemistry** – Electrolysis – Characteristics of Electrolysis – Applications of Electrolysis.

**Dyes**; Basic concept of colour and constitution.

UNIT 3: CHEMISTRY-III

**Biotechnology** – Introduction – Applications of Biotechnology – Fermentation Biotechnology.

**International Symbols for Units** – The CGS System or cm-g-s – The MKSA System or m-kg-s – The Degree Kelvin – International Systems of Units (SI-Units) – The Mole.

**Carbohydrates** – Classification – Sugars – Polysaccharides.

**Proteins** – Acidic and Basic Amino Acids – Amino acids as Dipolar ions – Peptides – Proteins – Structures of Proteins.

**Nucleoproteins and Nucleic acids** – The Genetic Code.


**Fats** – Soaps.
Important laws governing Gases, Liquids and Solutions – Gases – Colligative Properties.

Bioterrorism.


Important Concepts and Topics.

UNIT 4: GENERAL APTITUDE-I

Numerical ability-Simplification-Numbers-Ratio and proportion-Percentages-Profit and loss-Average and mixtures

UNIT 5: GENERAL APTITUDE-II

Mental ability-Time and work-Simple interest and compound interest-Geometry and mensuration-statistics-Data interpretation-Alpha-numeric reasoning-Visual reasoning

Reference Books:

1. Objective Chemistry by M.Sivakumar Sura’s publication, 2005.
UNIT 1: INTRODUCTION TO LEATHER CHEMISTRY

Importance of leather industry – scope of leather chemistry – distinction between hides, skins and leather – a detailed study of the structure and composition of hide and skins – Proteins and their characteristics – Anatomy and histology of protein constituents of leather.

UNIT 2: TANNING PROCESSES


UNIT 3: CHEMISTRY OF TANNING


UNIT 4: PRESERVATION AND PROCESSING OF LEATHER

Chemical methods of curing and presentation of hides and skins in acid and alkaline solutions. Principle of methods employed in curing, liming, deliming, bating and pickling – Process of dyeing leather- Use of mordants – Dyeing auxiliaries such as leveling, wetting and dispersing agents – Dye fixations.

UNIT 5: ENVIRONMENTAL IMPACT OF TANNERY INDUSTRIES & PROJECT WORK


Project: A small group project on collecting tannery effluents from various sources and their chemical analysis.

Reference Books:

2. Visit to a leather processing unit to understand the process of tanning and leather processing.
3. Visit to CLRI to have an idea of the research and development in leather industry.
UNIT I: COMPOSITION OF MILK

UNIT II: PROCESSING OF MILK

UNIT III: MAJOR MILK PRODUCTS

UNIT IV: SPECIAL MILK

UNIT V: FERMENTED AND OTHER MILK PRODUCTS

Reference Books:
UNIT I: INDUSTRIAL REQUIREMENTS


UNIT II: ENERGY


UNIT III: PETROCHEMICAL INDUSTRIES

Crude oil – constitution and distillation – composition – of different distillates – pour points, depressants, drag reducers, viscosity reducers, ignition point, flash point octane number – cracking – catalysts used in petroleum industries – structure, selectivity and applications.

UNIT IV: OILS, SOAPS AND DETERGENTS


UNIT V: OTHER INDUSTRIAL PRODUCTS


Reference Books:

4. Steines H., ntroduction to Petrochemicals, Pergaman Press.
Objectives:

**To enable the students**

➢ To learn about the basic chemistry of water and water analysis

*Name of the Experiments*

1. Determination of total hardness of water sample
2. Determination of permanent hardness of water sample
3. Determination of temporary hardness of water sample
4. Estimation of chloride content in water
5. Estimation of alkalinity in water sample
6. Estimation of total suspended solids (TSS)
7. Estimation of total dissolved solids (TDS)
8. Determination of pH of the water sample
9. Determination of conductivity of the water sample
PART- IV: Skill Based Subject

<table>
<thead>
<tr>
<th>Subject Title: Analytical Methods in Chemistry</th>
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<tr>
<td>Subject code: 07SB6F</td>
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<td>Sessional Marks: 25</td>
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Objectives:

To enable the students
- To learn about the theory of analytical chemistry
- To have an idea about the principles and applications of UV and CV
- To know about laboratory hygiene and safety

UNIT I: INTRODUCTION TO ANALYTICAL CHEMISTRY 6 Hrs

Types of Analytical methods: Importance of analytical methods in Qualitative and Quantitative analysis: Chemical and instrumental methods – advantages and limitations of chemistry and instrumental methods

UNIT II: CHROMATOGRAPHY TECHNIQUES 6 Hrs


UNIT III: SPECTRO ANALYTICAL TECHNIQUES 6 Hrs

Principles – Beer – Lambert's Law – Verification of Beer Lambert’s law – Qualitative (determination of λmax values of simple organic compounds) and Quantitative (determination of concentration of Manganese, Ferrous and Nickel ions).

UNIT IV: ELECTROANALYTICAL CHEMISTRY 6 Hrs

Cyclicvoltammetry basic principles- Testing the reversibility of a Reduction – Oxidation process.

UNIT V: LABORATORY HYGIENE AND SAFETY 6 Hrs

Storage and handling of corrosive, flammable, explosive, toxic, carcinogenic and poisonous chemicals. Simple First Aid procedures for accidents involving acids, alkalies, bromine, burns and cut by glass. Threshold vapour concentration – safe limits. Waste disposal.

Reference Books:

UNIT I:


UNIT II:

Conformation of acyclic compounds: restricted rotation about single bonds – staggered conformation – eclipsed conformation.

UNIT III:

Conformation of cyclic compounds: Angle strain – cyclohexane – equatorial and axial bonds of cyclohexane conformational interconversions of cyclohexane – other cyclohexanes – bicyclic and polycyclic compounds.

UNIT IV:


UNIT V:


Reference Book:

UNIT I: The heart of Education:

UNIT II: The Value of Body and Life Energy
Introduction – what are the causes for paid, Disease and death? Three Basic needs for all living Beings – Personal Hygeine Five Factors of Balance in Life – The need and benefits of physical Exercise – The value and Base of Life energy – The value and Base of Bio-magnetism - You are your own best caretaker.

UNIT III: The Marvelous nature of mind

UNIT IV: Analysis of Thought
Effects of good vibrations – Make Blessing a Daily Habit

UNIT V: Moralisation of Derive
Introduction – moralization of desire - Analyse your desires – Summary of practice. Neutralisation of Anger:
Introduction – meaning – characteristics of Anger – Anger is a Destructive emotion – Anger spoils our relationship with others – Some common misconception about anger – will power and method success through awareness – method of neutralisation of anger.

UNIT V: Eradication of Worries
Worry is a mental disease – Nature’s Law of cause and effect – factors beyond our control – How to deal with problems – analyse your problem and eradicate worry

Harmonious Relationships

Text Book: Value Education for Health, Happiness and Harmony
(Based on the Philosophy and Teachings of Swami Vethanthiri Maharisi)
Published By: Brain Trust, Aliyar A Wing of World Community Service Centre
### PART – V : Common Subject Theory

<table>
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<tr>
<td>Subject Code: <strong>EAUG61</strong></td>
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<td>Sessional Marks: 25</td>
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</table>

**UNIT-I:**

**Community Development-I:** definition – structure and composition – community based issues – need for awareness – Developmental Programmes.

**UNIT – II:**

**Community Development–II:** Rural Scenario – need of the Community – need for the community service – role of youth in community building – communal harmony – literacy – Educational Recreation.

**UNIT – III:**

**Volunteer Empowerment:** Women’s Emancipation – formation of Youth Clubs – Self-Help Groups – Youth and Development.

**UNIT – IV:**


**UNIT – V:**

**Introduction to NSS:** Basic Concepts – profile – aims – objectives – symbol – Motto – structure – Regular activities – Special Camping Programme – Adventure Programme – National Days and Celebrations.(Applicable to NSS Students)

(OR)


Civil Defence – Aid to civil authorities – Disaster management – Leadership – Man management – Adventure activities – Social service

**Reference Book:**

National Service Scheme Manual (Revised), Ministry of Human Resources Development, government of India.
B.Sc. Botany & Zoology Allied Chemistry CBCS Syllabus - SEMESTER I
(For those who joined in June 2015 and after)

<table>
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<th>PART III – Allied Course Theory</th>
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<tr>
<td>Subject Title: Inorganic, Organic and Physical Chemistry</td>
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<tr>
<td>Subject Code: 07AT01</td>
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<td>Sessional Marks: 25</td>
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Objectives:

To enable the students

- To become familiar in to the basic Principles Of Titrimetry
- To gain basic knowledge about Organic basic principles
- To have gain the basic concept of intermediates
- To be familiar with catalysis

UNIT I: GENERAL PRINCIPLES OF TITRIMETRY 12 Hrs


UNIT II: ORGANIC BASIC PRINCIPLES I 12 Hrs


UNIT III: ORGANIC BASIC PRINCIPLES II 12 Hrs


UNIT IV: ORGANIC INTERMEDIATES 12 Hrs


UNIT V: CATALYSIS AND PHOTOCHEMISTRY 12 Hrs


Text Book:
1. Ancillary chemistry Dr. K.Ratinamuthu (Study material will be provided) Semester – I and II

Reference Books:
B.Sc. Botany & Zoology Allied Chemistry CBCS Syllabus - SEMESTER II
(For those who joined in June 2015 and after)

<table>
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<tr>
<th>PART III – Allied Course Theory – II</th>
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<tbody>
<tr>
<td>Subject Title: Inorganic, Organic and Physical Chemistry – I</td>
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<tr>
<td>Subject Code: 07AT02</td>
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<td>Sessional Marks: 25</td>
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</table>

Objectives:

To enable the students

- To learn the basic Principles Of Titrimetry
- To gain basic knowledge about pesticides
- To have gain the basic concept of amino acids
- To be basic concept of chemical bonding
- To know about the pollution and the effect.

UNIT I: ACIDS AND BASES

12 Hrs


UNIT II: PESTIDCIDES, AND FUNGICIDES

12 Hrs


UNIT III: AMINOACIDS, PROTEINS AND VITAMINS

12 Hrs

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

UNIT IV: CHEMICAL BONDING

12 Hrs


UNIT V: POLLUTIONS

12 Hrs

Air pollution: Definition – Composition of air – Chemical reactions occurring in air due to sunlight– Sources of air pollution – Classification and effects of air pollutants – Effects of CFC – Ozone layer- Green house effect.

Text Book:
2. Ancillary chemistry K.Ratinamuthu (Study material will be provided)

Reference Books:
PART III – Allied Course Theory – I

Subject Title: Inorganic, Organic and Physical Chemistry – I

<table>
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<th>Subject Code</th>
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<td>07AT01</td>
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Sessional Marks: 25  Summative Marks: 75  Total Marks: 100

Objectives:

To enable the students

- To learn the basic Principles of Titrimetry
- To gain basic knowledge about Chemical Bonding
- To understand the theory of Nuclear Chemistry
- To be familiar with Selected Organic Compounds

UNIT I: PRINCIPLES OF TITRIMETRY  12 Hrs


UNIT II: CHEMICAL BONDING – I  12 Hrs

V.B. Theory – postulates of V.B. Theory – application to the formation of simple molecules like H₂ and O₂ – Overlap of atomic orbitals – s-s, s-p and p-p overlap – principle of hybridization – sp, sp² and sp³ hybridisation.

UNIT III: CHEMICAL BONDING – II  12 Hrs

Valence shell electron pair repulsion theory (VSEPR theory).

M.O. Theory: Formation of Molecular orbitals – bonding, anti-bonding and non-bonding molecular orbitals – Molecular orbital diagrams for H₂, He₂ and O₂

UNIT IV: NUCLEAR CHEMISTRY  12 Hrs

3. Nuclear fission: Definition – application of fission – the principle of atom bomb.
5. Applications of radioactivity – In medicine, agriculture, industry and analytical fields – carbon dating.

UNIT V: SOME SELECTED ORGANIC COMPOUNDS  12 Hrs

Preparation, properties and uses of TNT, BHC, Aspirin, Phenolphthalein, Malachite green, Crown Ethers and Lithium Aluminium hydride

Text Book:

1. Ancillary chemistry Dr. K.Ratinamuthu (Study material will be provided) Semester I and II

Reference Books:

PART III – Allied Course Theory – II

<table>
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Objectives:

To enable the students

- To be familiar with fundamentals of periodic properties
- To gain basic knowledge about Photochemistry
- To understand the theory of Solid State
- To be familiar with Electrochemistry
- To gain basic knowledge about chromatography techniques

UNIT I: PERIODIC PROPERTIES AND CHEMICAL BONDING 12 Hrs


UNIT II: PHOTOCHEMISTRY 12 Hrs


UNIT III: SOLID STATE 12 Hrs


UNIT IV: ELECTROCHEMISTRY 12 Hrs


UNIT V: CHROMATOGRAPHY TECHNIQUES 12 Hrs


Text Book:

1. Ancillary chemistry Dr. K.Ratinamuthu (Study material will be provided) Semester I & II.

Reference Books:

UNIT I: INTRODUCTION TO FOOD SCIENCE
Food in relation to health – Function of Food – Food groups – Nutritional deficiency – Cooking – Preliminary Preparations – Cooking methods – Microwave cooking

UNIT II: FOOD ADULTERATION

UNIT III: FOOD POISON

UNIT IV: FOOD ADDITIVES

UNIT V: FOOD TECHNOLOGY

Text book:

Reference Books:
List of Experiments

1. Preparation of Cleaning Powder
2. Preparation of Mixed Fruit Jam
3. Preparation of Washing Powder
4. Preparation of Fountain Pen Ink
5. Preparation of Liquid Blue
6. Preparation of Syrup
7. Preparation of White Phenyl
8. Preparation of Black Phenyl
9. Preparation of Lipstick
10. Preparation of Nail polish
11. Preparation of Shampoo