

**KONGUNADU ARTS AND SCIENCE COLLEGE
(AUTONOMOUS)
COIMBATORE – 641 029**



DEPARTMENT OF CHEMISTRY (UG)

**CURRICULUM AND SCHEME OF EXAMINATIONS (CBCS)
(2019 – 2020 and onwards)**

**KONGUNADU ARTS AND SCIENCE COLLEGE (AUTONOMOUS)
Coimbatore – 641029**

Vision

Developing the total personality of every student in a holistic way by adhering to the principles of **Swami Vivekananda** and **Mahatma Gandhi**.

Mission

- Imparting holistic and man-making education with emphasis on character, culture and value - moral and ethical.
- Designing the curriculum and offering courses that transform its students into value added skilled human resources.
- Constantly updating academic and management practices towards total quality management and promotion of quality in all spheres.
- Extending the best student support services by making them comprehensive and by evolving a curriculum relevant to student community and society at large.
- Taking steps to make education affordable and accessible by extending scholarships to the meritorious and economically disadvantaged students.
- Moulding the teachers in such a way that they become the role models in promoting Higher Education.

DEPARTMENT OF CHEMISTRY**Vision**

To provide personal, intellectual and professional growth of the students and to impart an ideal science education with the emphasis on man making and character building.

Mission

To produce quality and knowledgeable chemistry graduates capable of creating new developments for the society and preparing chemists of highest caliber for global standards, simultaneously imbibing Indian cultural values in the minds of the students.

PROGRAMME OUTCOME (PO)

On the successful completion of the programme, the following are the expected outcomes

PO 1

Understood the basic concepts, fundamental principles, and the scientific theories related to various scientific phenomena and their relevancies in the day today life.

PO 2

Acquired the skills in handling scientific instruments, planning and performing in laboratory experiments.

PO 3

The skills of observations and drawing logical inferences from the scientific experiments

PO4

Been able to think creatively (divergently and convergent) to propose novel ideas in explaining facts and figures or providing new solution to the problems

PO5

An understanding of professional, ethical, and social responsibilities

PO6

Determine the scope and perceive unique areas for further study and employability

PO7

Students will be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems.

PO8

To be exposed to the different process used in industries and their applications

PROGRAMME SPECIFIC OUTCOME (PSO)

PSO 1

Graduates will have a firm foundation in the fundamentals and application of current chemical and scientific theories including those in Analytical, Inorganic, Organic and Physical Chemistry.

PSO 2

Graduates are able to employ critical thinking and scientific inquiry in the performance, design, interpretation and documentation of laboratory experiments.

PSO 3

Graduates are able to grab enormous existing job opportunities at all levels of chemical, medical, food processing, material industries and educational institutions.

PSO 4

The graduates become entrepreneurs to own enterprises based on the national and International market potentials.

PSO 5

Graduates can perform good social responsibility with greater in ethics and conducive use of natural resources.

UCH 1

**CURRICULUM AND SCHEME OF EXAMINATIONS (CBCS)
(APPLICABLE TO STUDENTS ADMITTED DURING THE ACADEMIC YEAR
2019-2020 ONWARDS)**

| Semester | Part | Subject Code | Title of the Paper | Instruction | Exam Marks | | | Duration of Exam (Hours) | Credits |
|----------|------|-----------------------------|--|-------------|------------|-----------|------------|--------------------------|---------|
| | | | | | CIA | ESE | Total | | |
| I | I | 19TML101 | Language I@ | 6 | 25 | 75 | 100 | 3 | 3 |
| | II | 19ENG101 | English I | 6 | 25 | 75 | 100 | 3 | 3 |
| | III | 19UCH101 | Core Chemistry Paper- I Inorganic, Organic & Physical Chemistry - I | 6 | 25 | 75 | 100 | 3 | 5 |
| | | | Core Chemistry Practical- I Inorganic qualitative analysis & Preparations | 3 | - | - | - | - | - |
| | | 19UMA1A2/ 19UZO1A1 | Allied Mathematics Paper -I/ Allied Zoology Paper- I | 7/ 5 | 25/ 20 | 75/ 55 | 100/7 5 | 3 | 5/ 4 |
| | | Allied Zoology Practical | 2 | - | - | - | - | - | |
| | IV | 18EVS101 | Environmental Studies* * | 2 | - | 50 | 50 | 3 | 2 |
| II | I | 19TML202 | Language II@ | 6 | 25 | 75 | 100 | 3 | 3 |
| | II | 19ENG202 | English II | 6 | 25 | 75 | 100 | 3 | 3 |
| | III | 19UCH202 | Core Chemistry Paper- II Inorganic, Organic & Physical Chemistry - II | 6 | 25 | 75 | 100 | 3 | 5 |
| | | 19UCH2CL | Core Chemistry Practical- I Inorganic qualitative analysis & Preparations | 3 | 40 | 60 | 100 | 3 | 2 |
| | | 19UMA2A2/ 19UZO2A2 | Allied Mathematics Paper - II/Allied Zoology Paper- II | 7/ 5 | 25/ 20 | 75/ 55 | 100/7 5 | 3 | 5/ 4 |
| | | 19UZO2AL | Allied Zoology Practical | 2 | 20 | 30 | 50 | 3 | 2 |
| | IV | 18VED201 | Value Education-Moral & Ethics* * | 2 | - | 50 | 50 | 3 | 2 |
| III | I | 19TML303 | Language III @ | 6 | 25 | 75 | 100 | 3 | 3 |
| | II | 19ENG303 | English III | 6 | 25 | 75 | 100 | 3 | 3 |
| | III | 19UCH303 | Core Chemistry Paper- III Inorganic, Organic & Physical Chemistry - III | 4 | 25 | 75 | 100 | 3 | 4 |
| | | | Core Chemistry Practical- II Inorganic volumetric and organic qualitative analysis | 3 | - | - | - | - | - |
| | | 19UPH3A1 | Allied Physics Paper- I | 4 | 20 | 55 | 75 | 3 | 4 |
| | | Allied Physics Practical- I | 3 | - | - | - | - | - | |

UCH 2

| | | | | | | | | | |
|----|-----|------------------------------------|--|-------|----|----|-----|---|---|
| | IV | 19UGA3S1 | Skill Based Subject- I General Awareness (on line) | 2 | 25 | 75 | 100 | 3 | 3 |
| | | 18TBT301/18 TAT301/ 19UHR3N1 | Basic Tamil*/ Advanced Tamil**/ Non Major elective -I ** | 2 | 75 | | 75 | 3 | 2 |
| IV | I | 19TML404 | Language IV @ | 6 | 25 | 75 | 100 | 3 | 3 |
| | II | 19ENG404 | English IV | 6 | 25 | 75 | 100 | 3 | 3 |
| | III | 19UCH404 | Core Chemistry paper- IV Inorganic, Organic & Physical Chemistry - IV | 4 | 25 | 75 | 100 | 3 | 4 |
| | | 19UCH4CM | Core Chemistry Practical- II Inorganic volumetric and organic qualitative analysis | 3 | 40 | 60 | 100 | 6 | 3 |
| | | 19UPH4A2 | Allied Physics Paper- II | 5 | 20 | 55 | 75 | 3 | 4 |
| | | 19UPH4AL | Allied Physics Practical -I | 2 | 20 | 30 | 50 | 3 | 2 |
| | IV | 19UCH4S2 | Skill Based Subject -II Water pollution and management | 2 | 25 | 75 | 100 | 3 | 3 |
| | IV | 18TBT402/18 TAT402/ 18UWR4N2 | Basic Tamil*/ Advanced Tamil**/ Non Major elective – II** | 2 | | 75 | 75 | 3 | 2 |
| V | III | 19UCH505 | Core Chemistry Paper –V Spectroscopy | 3 | 25 | 75 | 100 | 3 | 3 |
| | | 19UCH506 | Core Chemistry Paper –VI Inorganic Chemistry | 4 | 25 | 75 | 100 | 3 | 4 |
| | | 19UCH507 | Core Chemistry Paper –VII Organic reaction mechanism | 4 | 25 | 75 | 100 | 3 | 4 |
| | | 19UCH508 | Core Chemistry Paper –VIII Physical Chemistry - I | 4 | 25 | 75 | 100 | 3 | 4 |
| | | 19UCH5E1 | Major Elective -I | 3 | 25 | 75 | 100 | 3 | 5 |
| | | 19UCH6CN | Core Chemistry Practical -III Gravimetric Analysis | 3 | - | - | - | - | - |
| | | 19UCH6CO | Core Chemistry Practical–IV Physical Chemistry Experiments | 4 | - | - | - | - | - |
| | | 19UCH6CP | Core Chemistry Practical –V Application Oriented practical | 3 | - | - | - | - | - |
| | IV | 19UCH5X1 | EDC - Chemistry in day today life | 2 | 25 | 75 | 100 | 3 | 3 |
| | - | 19UCH5IT | Internship training***** | Grade | | | | | |

UCH 3

| | | | | | | | | | |
|-------------|-----|---------------------------|--|---|----|----|------|---|-----|
| VI | III | 19UCH609 | Core Chemistry Paper-IX Solid State And Coordination Chemistry | 4 | 25 | 75 | 100 | 3 | 4 |
| | | 19UCH610 | Core Chemistry Paper-X Chemistry Of Natural Products | 5 | 25 | 75 | 100 | 3 | 4 |
| | | 19UCH611 | Core Chemistry Paper-XI Physical Chemistry - II | 4 | 25 | 75 | 100 | 3 | 4 |
| | | 19UCH6E1 | Major Elective – II | 3 | 25 | 75 | 100 | 3 | 5 |
| | | 19UCH 6Z1 | Project*** | 2 | 20 | 80 | 100 | - | 5 |
| | | 19UCH6CN | Core Chemistry Practical- III Gravimetric Analysis | 3 | 40 | 60 | 100 | 3 | 3 |
| | | 19UCH6CO | Core Chemistry Practical-IV Physical Chemistry Experiments | 3 | 40 | 60 | 100 | 3 | 3 |
| | | 19UCH6CP | Core Chemistry Practical –V Application Oriented practicals | 4 | 40 | 60 | 100 | 3 | 4 |
| | IV | 19UCH6S3 | Skill Based Subject- III Food chemistry | 2 | 25 | 75 | 100 | 3 | 3 |
| | V | 19NCC/NSS/Y RC/ PYE101 | Extension Activities # | - | 50 | - | 50 | - | 1 |
| Grand total | | | | - | - | - | 3000 | - | 140 |

Note

CBCS – Choice Based Credit System

CIA – Continuous Internal Assessment

ESE – End of Semester Examinations

@ Hindi / Malayalam / French / Sanskrit – 19HIN/MLM/FRN/SAN101-202

* No End of Semester Examinations (ESE). Only Continuous Internal Assessment (CIA).

** No Continuous Internal Assessment (CIA). Only End of Semester Examinations (ESE).

*** Project Report – 60 marks; Viva-voce – 20 marks; Internal – 20 marks

**** The students shall undergo an internship training/ field work for a minimum period of two weeks at the end of the 4th semester during summer vacation and submit the report in the fifth semester. The Report will be evaluated for 100 Marks along with the internal viva voce by the respective faculty. According to the marks grades will be awarded as given below

UCH 4

| Marks % | Grade |
|---------|--------------|
| 85-100 | O |
| 70-84 | D |
| 60-69 | A |
| 50-59 | B |
| 40-49 | C |
| <40 | U (Reappear) |

MAJOR ELECTIVE PAPERS

(Two papers are to be chosen from the following four papers.)

1. Polymer technology
2. Nano and green Chemistry
3. Pharmaceutical Chemistry
4. Agricultural Chemistry
5. Dairy Chemistry
6. Leather Chemistry

Non-Major Elective Papers

1. Human Rights
2. Women's Rights
3. Consumer awareness

Sub. Code & Title of the Extra Departmental Course (EDC) :

19UCH5X1 - Chemistry in day today life

List of Extension Activities:

1. National Cadet Corps (NCC)
2. National Service Scheme (NSS)
3. Youth Red Cross (YRC)
4. Physical Education (PYE)
5. Eco Club (ECC)
6. Red Ribbon Club (RRC)
7. Women Empowerment Cell (WEC)

Note: In core/ allied subjects, no. of papers both theory and practical are included wherever applicable. However, the total credits and marks for core/allied subjects remain the same as stated below.

UCH 5

Tally Table:

| S.No. | Part | Subject | Marks | Credits |
|-------|------|--|-------------|------------|
| 1. | I | Language – Tamil/Hindi/Malayalam/ French/ Sanskrit | 400 | 12 |
| 2. | II | English | 400 | 12 |
| 3. | III | Core – Theory/Practical | 1600 | 60 |
| | | Allied | 400 | 20 |
| | | Electives/Project | 300 | 15 |
| 4. | IV | Basic Tamil / Advanced Tamil (OR) Non-major electives | 150 | 4 |
| | | Skill Based subject | 300 | 9 |
| | | EDC | 100 | 3 |
| | | Environmental Studies | 50 | 2 |
| | | Value Education | 50 | 2 |
| 5. | V | Extension Activities | 50 | 1 |
| | | Total | 3800 | 140 |

- 25 % CIA is applicable to all subjects except JOC, COP and SWAYAM courses which are considered as extra credit courses.
- The students are advised to complete a **SWAYAM-MOOC** before the completion of the 5th semester and the course completed certificate should be submitted to the HOD. Two credits will be given to the candidates who have successfully completed.
- A **Field Trip** preferably relevant to the course should be undertaken every year.

UCH 6

Components of Continuous Internal Assessment

| Components | | Marks | Total |
|----------------------|----|------------------|-------|
| Theory | | | |
| CIA I | 75 | (75+75 = 150/10) | 25 |
| CIA II | 75 | 15 | |
| Assignment/Seminar | | 5 | |
| Attendance | | 5 | |
| Practical | | | |
| CIA Practical | | 25 | 40 |
| Observation Notebook | | 10 | |
| Attendance | | 5 | |
| Project | | | |
| Review | | 15 | 20 |
| Regularity | | 5 | |

UCH 7

BLOOM'S TAXONOMY BASED ASSESSMENT PATTERN

K1-Remembering; K2-Understanding; K3-Appling; K4-Analyzing; K5-Evaluating

1. Theory Examination - Part I, II & III

(i) CIA I & II and ESE: 75 Marks

| Knowledge Level | Section | Marks | Description | Total |
|-------------------|-----------------------|-------------|------------------------|-------|
| K1 Q1 to 10 | A (Answer all) | 10 x 1 = 10 | MCQ | 75 |
| K2 Q11 to 15 | B (Either or pattern) | 5 x 5 = 25 | Short Answers | |
| K3 & K4 Q16 to 20 | C (Either or pattern) | 5 x 8 = 40 | Descriptive / Detailed | |

(ii) CIA I & II and ESE: 55 Marks

| Knowledge Level | Section | Marks | Description | Total |
|-------------------|-----------------------|-------------|------------------------|-------|
| K1 Q1 to 10 | A (Answer all) | 10 x 1 = 10 | MCQ | 55 |
| K2 Q11 to 15 | B (Either or pattern) | 5 x 3 = 15 | Short Answers | |
| K3 & K4 Q16 to 20 | C (Either or pattern) | 5 x 6 = 30 | Descriptive / Detailed | |

2. Practical Examination:

| Knowledge Level | Section | Marks | Total |
|-----------------|-------------|-------------|-------|
| K3 | Experiments | 50 | 60 |
| K4 | | Record Work | |
| K5 | | | |

UCH 8

3. Project Viva Voce:

| Knowledge Level | Section | Marks | Total |
|-----------------|----------------|-------|-------|
| K3 | Project Report | 60 | 80 |
| K4 | Viva voce | 20 | |
| K5 | | | |

UCH 9

19UCH101

| | | | | |
|------------------------------|---------------|--|-------------------|--------------|
| Programme: B.Sc. | | Title: Chemistry | | |
| Course Code: 19UCH101 | | Title: CORE CHEMISTRY PAPER – I INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY - I | | |
| Batch 2019-2020 | Semester I | Hours / Week 6 | Total Hours 90 | Credits 5 |

Course Objectives

1. To know the concept of qualitative inorganic analysis.
2. To acquaint knowledge about electron displacement effects, hybridization and conformations.
3. To know about the structure of an atom.

Course Outcomes (CO)

| | | |
|--------|-----|--|
| K2 | CO1 | Explain the basic analytical knowledge and group separation of elements. |
| K2,K3 | CO2 | Understand and apply the nomenclature of inorganic and organic compounds. |
| K2, K3 | CO3 | Explain the isomerism of alkanes and cycloalkanes. |
| K2 | CO4 | Acquire the knowledge about the structure of atoms. Understand characteristics of gases. |

UNIT – I

Qualitative analysis

Introduction - Dry reactions – heating, flame tests; Wet reactions – test tubes, centrifuge tubes, stirring rods, droppers, reagent bottles and reagents, the centrifuge, washing the precipitates, wash bottles, transferring of precipitates, heating of solutions, evaporation, dissolving of precipitates, precipitation with hydrogen sulphide, cleaning of apparatus. Interfering anions and its elimination, classification of cations into analytical groups (group separation only), scheme of classification of anions. (18 hours)

UNIT-II

Nomenclature of inorganic and organic compounds

Writing symbols of elements and formulae of inorganic species- inorganic nomenclature- names of compounds in general-names of ions – names of radicals –names of isopolyanions-names of hetero polyanions –names of acids – names of salts and salt like compounds –names of addition compounds –names of neutral hydrides –names of boron hydrides. Nomenclature of cations, anions, radicals, binary acids, oxy acids, peroxy acids salts, binary compounds, hydrates, double salts.

Nomenclature of organic compounds – Introduction, systems of naming organic compounds – Rules of IUPAC system of nomenclature for cyclic compounds , complex

UCH 10

organic compounds – substituted alkanes, alkenes and alkynes, compounds having functional groups, polyfunctional compounds. (18 hours)

UNIT-III

Chemistry of alkanes and Cycloalkanes

Inductive effect, electromeric effect, mesomeric effect and hyperconjugative effect. Homolytic and heterolytic fission, Reaction Intermediates-carbocations, carbanions, carbon free radicals and carbenes.

Classification of reagents: Electrophiles and nucleophiles.

Types of organic reactions- Substitution, addition, elimination and rearrangement reactions (Basic ideas only).

Structure – Nomenclature - Isomerism in alkanes – Natural source of alkanes – Methods of preparation – physical properties - chemical properties – Conformation study of ethane and n-butane.

Nomenclature – methods of preparation – physical and chemical properties. Stability of cycloalkanes . Bayer strain theory. (18hours)

UNIT-IV

Structure of atom – Classical Mechanics and Wave mechanical approach

Introduction of classical mechanics approach - Quantum Theory and Bohr Atom. Wave mechanical concept of atom – de Broglie's equation . Heisenberg's Uncertainty principle. Schrodinger's Wave equation. Charge cloud concept and orbitals. Quantum Numbers-Principal, Azimuthal, Magnetic and Spin Quantum Numbers and their significance. Pauli's Exclusion principle. Energy distribution and orbitals. Distribution of electrons in orbitals. Representation of ground state electronic configuration of elements – ***Aufbau principle, n+l rule and Hund's rule**. Pauling's exclusion principle. (18 hours)

UNIT-V

Gaseous state

Characteristics of gases- parameters of a gas. Gas laws-Boyle's law, Charles's Law, Gay lussac's law and Avogadro's law. The ideal gas equation- kinetics of molecular theory of gases. Derivation of kinetic gas equation. Distribution of molecular velocities- calculation of molecular velocities. Collision properties. vander-waals equation – Liquefaction of gases – Law of corresponding states- Methods of liquefaction of gases. (18 hours)

**self study portion*

Teaching Methods

| |
|--|
| Powerpoint presentation/Seminar/Quiz/Discussion/Assignment |
|--|

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TEXT BOOKS

1. G. Svehla, (1997) **Vogel's Text book of Macro and Semimicro Qualitative Analysis**, Longman Inc., Newyork.
2. R. D. Madan, (2004) **Modern Inorganic Chemistry**, S. Chand & Co., New Delhi.
3. M.K. Jain. S.C. Sharma, (2004) **Modern Organic Chemistry**, Vishal publishing Co., New Delhi .
4. B. R. Puri, L. R. Sharma, K. K. Kalia, (2014) **Principles of Inorganic Chemistry**, Milestone Publishers and Distributors, New Delhi.
5. Arun Bahl , B.S.Bahl, (2012) **Advanced Organic Chemistry**, S. Chand & Co., New Delhi, Revised multicolor edition.
6. Arun Bahl and B.S.Bahl, G.D.Tuli, (2012) **Essentials of Physical Chemistry**, S. Chand & Co., New Delhi, Revised multicolor edition.

REFERENCE BOOKS

1. Sathya Praksash, G.D. Tuli, S. K. Basu, R.D. Madan, (2012) **Advanced Inorganic Chemistry**, Vol. 1, S. Chand & Co., New Delhi.
2. J. D. Lee, (2006) **Concise Inorganic Chemistry**, Black Well Science, UK.
3. M. K. Jain, S. C. Sharma, (2011) **Modern Organic Chemistry**, Vishal Publishing Co., New Delhi,.
4. S. Glasstone, D. Lewis, (2004) **Elements of Physical Chemistry**, Macmillan Ltd, London.

18UCH101

MAPPING

| CO \ PSO | PSO1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|-----------------|-------------|--------------|--------------|--------------|--------------|
| CO1 | S | S | H | M | H |
| CO2 | S | S | M | M | M |
| CO3 | S | S | M | M | M |
| CO4 | S | S | H | M | M |

S – Strong

H – High

M – Medium

L – Low

SEMESTER I

PART IV – ENVIRONMENTAL STUDIES

Total Credits: 2

Total Hours: 30

Objectives:

- To inculcate knowledge and create awareness about ecological and environmental concepts, issues and solutions to environmental problems.
- To shape students into good “ecocitizens” thereby catering to global environmental needs.

UNIT I MULTIDISCIPLINARY NATURE OF ENVIRONMENT

Definition : scope and importance – Need for public awareness - Natural resources – Types of resources – Forest Resources – Water Resources – Mineral Resources – Food Resources – Energy Resources – Land Resources. (6 hours)

UNIT II ECOSYSTEMS

Concept of an ecosystem – Structure and functions of an ecosystem – Procedures, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food web and ecological pyramids – Structure and function of the following ecosystem – Forest Ecosystem – Grassland Ecosystem – Desert Ecosystem – Aquatic Ecosystem. (6 hours)

UNIT III BIODIVERSITY AND ITS CONSERVATION

Introduction – Definition – Genetic – Species and ecosystem diversity- Bio geographical classification of India – Value of biodiversity – Biodiversity at global, national and local levels – India as a mega - diversity Nation - Hot spot of biodiversity – Threats to biodiversity - Endangered and endemic species of India – Conservation of Biodiversity – insitu Conservation of Biodiversity – exsitu Conservation of Biodiversity. (6hours)

UNIT IV ENVIRONMENTAL POLLUTION

Definition - Causes, effects and control measures of : Air Pollution – Water Pollution – Soil Pollution – Marine Pollution – Noise Pollution – Thermal Pollution – Nuclear Pollution – Solid Waste Management: Causes, effects, control measures of urban and industrial wastes – Role of individual in prevention of pollution – Pollution case studies – domestic waste water, effluent from paper mill and dyeing, cement pollution – Disaster Management – Food, Drought, Earthquake, Tsunami, Cyclone and Landslide. (6 hours)

UNIT V SOCIAL ISSUES AND THE ENVIRONMENT

Sustainable Development – Urban problems related to energy – Water Conservation: Rain Water Harvesting and Watershed Management – Resettlement and rehabilitation of people, its problems and concerns, case studies Narmatha Valley Project – Environmental ethics, issues and possible solutions – Climate change, global warming, ozone layer depletion,

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acid rain, nuclear accidents and holocaust, case studies – Hiroshima and Nagasaki, Chernobyl – Consumerism and waste products – Environmental Protection Act – Air Pollution Act (Prevention and Control) – Water Pollution Act (Prevention and control) – Wild Life Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness – Human Population and the environment – Population Growth and Distribution – Population Explosion – Family Welfare Programme – Environment and Human Health – Human Rights – Value Education – HIV/ AIDS – Women and Child Welfare – Role of Information Technology in Environment and Human Health. (6 hours)

Self Study (Questions may be asked from these topics also)

Text Book

1.P.Arul, A Text Book of Environmental Studies, Environmental Agency, No 27, Nattar street, Velacherry main road, Velacheery, Chennai – 42, First Edition, Nov.2004.

Reference Books

1.Purohit Shammi Agarwal, A text Book of Environmental Sciences, Publisher Mrs.Saraswati Prohit, Student Education , Behind Naswan Cinema Chopansi Road, Jodhpur.

2.Dr.Suresh and K.Dhameja, Environmental Sciences and Engineering , Publisher S.K.Kataria & Sons, 424/6, Guru Nanak Street, Vaisarak, Delhi -110 006.

3.J.Glynn Henry and Gary W Heinke, Environmental Science and Engineering, Prentice Hall of India Private Ltd., New Delhi – 110 001.

Teaching Methods

| |
|--|
| Powerpoint presentation/Seminar/Quiz/Discussion/Assignment |
|--|

Question Paper Pattern

(External only)

Duration: 3 hours

Total Marks : 50

Answer all Questions (5 x 10 = 50 Marks)

Essay type, either or type questions from each unit.

| | | | | |
|------------------------------|----------------|--|-------------------|--------------|
| Programme: B.Sc. | | Title: CHEMISTRY | | |
| Course Code: 19UCH202 | | Title: CORE CHEMISTRY PAPER – II INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY - II | | |
| Batch 2019-2020 | Semester II | Hours / Week 6 | Total Hours 90 | Credits 5 |

Course Objectives

1. To learn the basic principles and concepts of metallurgy and their applications
2. Know about metallurgy, importance of periodic table and atomic properties.
3. To learn about alcohols and aromatic compounds.
4. To study the fundamentals of thermodynamics and thermochemistry.

Course Outcomes (CO)

| | | |
|--------|-----|---|
| K1, K3 | CO1 | Obtain problem solving skills in order to modify industrial processes in extraction metallurgy. |
| K1, K2 | CO2 | Gain knowledge about periodic properties and understand the basic aspects of alcohols and aromatic compounds. |
| K1, K3 | CO3 | Learn about concepts of thermodynamics. |
| K1, K4 | CO4 | Acquire the knowledge in thermochemistry. |

UNIT-I : Metallurgy

***Introduction-Minerals, ores - occurrence of metals-classification of ores**-various steps involved in the metallurgical processes- concentration of ores, working of concentrated ore- calcination – roasting - smelting - Ellingham Diagram-Thermodynamic Principles-reduction by carbon-alumino thermic process-reduction by heating air-electrolytic reduction- purification of metals-liquation-distillation-oxidation-cupellation- electro refining - zone refining-van Arkel process-Amalgamation process-Mond's process, Extraction of Iron, Extraction of Copper, extraction of aluminium, extraction of Silver, extraction of Zinc

(18 hours)

UNIT-II: Periodic table and atomic properties

Mendeleev Periodic Table, Modern Periodic table-Long form periodic table, Description of groups-Alkali metals-Alkali earth metals-Boron Family-Carbon Family-Nitrogen family/Pnicogens-Oxygen family/Chalcogens-Halogen family-Inert gases/Noble gases – IUPAC nomenclature for the super heavy elements, Merits and Demerits of long form of periodic table.

Classification of Elements-Bohr classification-Basis of Sub Shell in which last electron enters(s, p, d, f), Periodicity-Causes of periodicity, Calculation of effective nuclear charge, Periodic Properties, Atomic Size-Covalent radius--Ionic Radius-Metallic radius-Vander Waal's radius, Factors affecting atomic size, Ionization energy – factors affecting ionization energy-applications of ionization energy, Electron affinity-Factors affecting electron affinity, Electronegativity-Factors Affecting electronegativity-applications of electronegativity.

(18 hours)

UNIT-III**Benzene and Aromaticity****Nomenclature**

Naming of monosubstituted Benzene, disubstituted benzene and polysubstituted benzene. Benzenoid and non benzenoid aromatic electrophilic substitution reaction. Arenium ion mechanism.

Reactions – Nitration, sulphonation, halogenation, Friedel Crafts alkylation and acylation, orientation and reactivity of monosubstituted benzene.

Aromaticity The concept of Aromaticity, Aromatic, anti aromatic, and non aromatic compounds, Huckel's rule.

Toluene, cumene and styrene – Preparation, Physical and Chemical properties. (18 hours)

UNIT-IV**Thermodynamics - I**

Basic concepts - scope and limitations - Thermodynamic terms - intensive and extensive properties- state, equilibrium - processes-nature of heat and work – pressure – volume work - isothermal reversible and irreversible expansion works of an ideal gas - maximum work - Zeroth law of thermodynamics - Internal Energy and First law of thermodynamics - Enthalpy of a system-Relation between ΔE and ΔH -Relation between C_p and C_v – Joule Thomson effect -comparison between adiabatic and isothermal expansions - Adiabatic expansion of an ideal gas -work done in adiabatic reversible expansion. (18 hours)

UNIT-V**Thermochemistry**

Introduction - exothermic and endothermic reactions - Thermo chemical equations - Kirchoff's equation - types of heat of reaction - heat of formation - standard heat of formation - standard heat of reaction - heat of combustion-heat of solution - heat of neutralization-heat of fusion - heat of vaporization - heat of sublimation and heat of transition – definition - simple problems. Hess's law of constant heat summation – applications - bond energy and strength of bond - experimental determination of heat of combustion - bomb calorimeter.

(18 hours)

**self study portion*

Teaching Methods

| |
|--|
| Powerpoint presentation/Seminar/Quiz/Discussion/Assignment |
|--|

TEXT BOOKS

1. Puri B.R, Sharma L.R, Kalia K.C., (2014) **Principles of Inorganic Chemistry**, MILESTONE publishers and Distributors, New Delhi.
2. Sathya praksash, G.D. Tuli, S. K. Basu, R.D. Madhan, (2012) **Advanced Inorganic Chemistry**, Volume 1, S. Chand & Company, New Delhi.
3. M.K. Jain, S.C. Sharma, (2011) **Modern Organic Chemistry**, Vishal Publishing Co., Delhi.
4. B.S. Bahl, and Arun Bahl, (2012) **Advanced Organic Chemistry**, S.Chand andCo,

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New Delhi, Revised multicolor edition.

5. B.S. Bahl and G. D. Tuli, and Arun Bahl, (2012) **Essentials of Physical Chemistry**, S. Chand publishing, Revised multicolor edition.

REFERENCE BOOKS

1. R. D. Madan, (2011) **Modern Inorganic Chemistry**, S.Chand and Co., Third Revised Edition.
2. R. Gopalan, (2009) **Inorganic Chemistry For Undergraduate**, Universities Press (India) Private Limited, Hyderabad.
3. Puri B. R. Sharma L. R., M. S. Pathania, (2013) **Principles of Physical Chemistry**, Vishal Publishing Co., New Delhi.

19UCH202

MAPPING

| PSO CO | PSO1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|-------------------|-------------|--------------|--------------|--------------|--------------|
| CO1 | S | S | H | H | H |
| CO2 | S | S | M | M | M |
| CO3 | S | S | H | H | M |
| CO4 | S | S | H | H | M |

S – Strong

H – High

M – Medium

L – Low

SEMESTER-II

PART-IV VALUE EDUCATION: MORAL AND ETHICS

Total Hours : 30

Total Credits: 2

OBJECTIVES:

- To impart the value education in every walk of life.
- To make them understand the relationship between Moral and Ethics.
- To impart the right attitude by practicing self introspection.
- To make them realize about their hidden power within them.
- To develop a knowledge for the steps of upliftment.
- To know about their goal of life.
- To make them understand the importance of yoga and meditation.
- To realize what is the real peace.
- To understand what are the ways to contribute peace to the whole world.
- To goad youth to reach excellence and reap success.

UNIT I:

6hrs

Introduction – Meaning of Moral and Ethics – Ethics and Culture – Aim of Education.

UNIT II:

6hrs

Swami Vivekananda – A Biography.

UNIT III:

6hrs

The Parliament of Religions – Teachings of Swami Vivekananda.

UNIT IV:

6hrs

Steps for Human Excellence.

UNIT V:

6hrs

Yoga & Meditation.

Text Book

Value Base Education – Moral and Ethics – Published by Kongunadu Arts and Science College (Autonomous), First Edition, 2015.

Reference Book

Easy steps to Yoga by Swami Vivekananda, A Divine Life Society Publication, 2000.

Question paper pattern

(External only)

Duration: 3 hrs

Total Marks: 50

Answer all Questions (5 x 10 = 50 Marks)

Essay type, either or type questions from each unit.

| | | | | |
|------------------------------|--------------------|--|-------------------|--------------|
| Programme: B.Sc. | | Title: Chemistry | | |
| Course Code: 19UCH2CL | | Title: CORE CHEMISTRY PRACTICAL – I INORGANIC QUALITATIVE ANALYSIS AND PREPARATIONS | | |
| Batch 2019-2020 | Semester I & II | Hours / Week 3 | Total Hours 90 | Credits 2 |

Course Objectives

1. To demonstrate the basic laboratory technique of semimicro qualitative analysis.
2. To understand about the interfering anions, its elimination and group separation.
3. To prepare inorganic complexes.

Course Outcomes (CO)

| | | |
|--------|-----|---|
| K1,K2 | CO1 | Build the knowledge in principles of semi micro qualitative analysis. |
| K2 | CO2 | Know about the interfering and non interfering anions. |
| K2, K4 | CO3 | Experience to remove interfering anion and group separation of various cations. |
| K2, K3 | CO4 | Learn the preparation of inorganic complexes. |

I Semi - Micro Qualitative Analysis

Analysis of a mixture containing two cations and two anions of which one will be an interfering ion. Semi-micro methods using the conventional scheme with Hydrogen Sulphide may be adopted.

II. Preparation of Inorganic Complexes.

1. Tetraamminecopper(II) sulphate
2. Potassiumtrioxalatochromate(III)
3. Iron(III) hexacyanoferrate(II)
4. Hexamminecobalt(II) chloride
5. Hexathiourealead(II) nitrate
6. Trithioureacopper(I) sulphate

TEXT BOOKS

1. Venkateswaran. V, Veeraswamy. R, Kulandaivelu . A.R, (1997), **Basic Principles of Practical Chemistry**, New Delhi, Sultan Chand and Sons,

BOOKS FOR REFERENCE

1. G. Svehla, (1987) , **Vogel's Qualitative Inorganic Analysis**, Orient Longman Ltd, Hyderabad.

UCH 20

Time: 3 hours

Max. Marks : 60

Distribution of Total Marks: 60

| | |
|-------------|----------|
| Record | 10 marks |
| Analysis | 40 marks |
| Preparation | 10 marks |

Distribution of Analysis Marks: 40

| | |
|-----------------------------------|----------|
| Four ions with correct Procedure | 40 marks |
| Three ions with correct Procedure | 30 marks |
| Two ions with correct Procedure | 25 marks |
| One ions with correct Procedure | 12 marks |

- ❖ Spotting of an ion -5 marks
- ❖ Precipitation- 5marks
- ❖ Correct detection of cations without eliminating the interfering ion should be treated as spotting
- ❖ At least one confirmatory test for each ion is expected. If no confirmatory test is reported deduct 3 marks
- ❖ The candidate may be asked to leave a small portion of the given mixture so that the examiners may confirm the presence of an ion if any discrepancies arise.
- ❖ **Anions to be given:** Sulphate, Chloride, Bromide, Fluoride, Borate, Nitrate, Carbonate, Oxalate, and Phosphate.
- ❖ **Cations to be given:** Lead, Bismuth, Copper, Manganese, Aluminium, Ferrous, Ferric, Cadmium, Cobalt, Nickel, Zinc, Barium, Calcium, Strontium, Magnesium and Ammonium.

19UCH2CL

MAPPING

| PSO CO | PSO1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|-----------|------|-------|-------|-------|-------|
| CO1 | S | S | H | M | M |
| CO2 | S | S | H | M | M |
| CO3 | S | S | H | M | M |
| CO4 | S | S | S | M | M |

S – Strong

H – High

M – Medium

L – Low

| | | | | |
|------------------------------|-----------------|--|-------------------|--------------|
| Programme: B.Sc. | | Title: Chemistry | | |
| Course Code: 19UCH303 | | Title: CORE CHEMISTRY PAPER – III INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY - III | | |
| Batch 2019-2020 | Semester III | Hours / Week 4 | Total Hours 60 | Credits 4 |

Course Objectives

1. To know the basic concepts in quantitative analysis.
2. To observe the chemistry of dicarboxylic acids and reactions involving carbonyl compounds.
3. To enumerate second law of thermodynamics, state functions S, A, G and chemical equilibrium.

Course Outcomes (CO)

| | | |
|--------|-----|---|
| K2, K3 | CO1 | Gain knowledge in preparation, standardization of solution and principles of volumetric analysis. |
| K1, K2 | CO2 | Study the preparation, properties and reactions of dicarboxylic acids, unsaturated acids and hydroxy acids. |
| K1, K2 | CO3 | Study on the preparation and properties of aldehydes and ketones. |
| K3, K4 | CO4 | Analyze and apply laws of thermodynamics and thermodynamic properties. |

UNIT-I

Quantitative Analysis

1. The mole concept – atomic, molecular and molar masses. Equivalent mass – Equivalent mass of an acid, equivalent mass of a base, equivalent mass of oxidizing and reducing agents.
2. concentration terms – Normality, molarity, mole fraction, molality, percentage solution – weight composition, volume composition.
3. Principles of volumetric analysis – standard solution (primary and secondary standards) titration – types (acid, base, oxidation, reduction), equivalent point, end point, indicators – action of phenolphthalein and methyl orange, caution in volumetric titrimetry – precautions to avoid errors in titrimetric analysis, corrections for unavoidable errors. (12 hours)

UNIT-II

Dicarboxylic acids

Preparation, physical and chemical properties and uses of Oxalic, Malonic, Succinic, Glutaric and Adipic acids. Preparation, physical and chemical properties and Geometrical isomerism of Maleic acid and Fumaric acid. Malonic ester and Acetoacetic ester - synthetic applications. Tautomerism of Acetoacetic ester. (12 hours)

UNIT-III**Aldehydes and ketones**

General methods of preparations and properties. Mechanism of Nucleophilic addition of Grignard reagents, aldol condensation, Perkin, Knoevenagel, Claisen, Reformatsky reaction, reactions with LiAlH_4 and NaBH_4 , WolfKishner, Meerwein-Ponndorf-Verley reductions and Cannizzaro reactions, Claisen and Dieckmann reactions. (12 hours)

UNIT-IV Thermodynamics-II

Limitations of First law – need for second law. Various statements of second law. Spontaneous or irreversible processes. Criteria of spontaneity - Cyclic process- Entropy – definition - numerical definition. The Carnot's cycle- thermodynamic efficiency. Derivation of entropy from Carnot's cycle. Physical significance of entropy- Entropy change in isothermal expansion of an ideal gas, entropy change in reversible and irreversible processes, entropy change accompanying change of phase. Entropy as the function of P, V and T. Some other state functions-Work and Free energy functions - Gibbs's free energy (G) and Helmholtz free energy (A)- variation of free energy with temperature and pressure. Isothermal change in free energy - Gibbs-Helmholtz equations. The Clapeyron Equation-Clausius – Clapeyron equation-its applications. Significance of ΔA and ΔG . van't Hoff isotherm –van't Hoff isochore. Fugacity and activity. (12 hours)

UNIT-V Thermodynamics-III

Partial molal properties: Concept of chemical potential- Physical significance-The Gibbs – Duhem equation-variation of chemical potential with T and P- Time's Arrow . Need for third law of thermodynamics – Nernst heat theorem- Third law of thermodynamics. Determination of absolute entropy of solids, liquids and gases. Standard absolute entropies (S°). Entropy change in chemical reactions. Unattainability of absolute zero. Derivation of Boltzmann entropy equation. Residual entropy. Problems involving residual entropy. Stirling's approximation. (12 hours)

****self study portion*****Teaching Methods**

Power point presentation/Seminar/Quiz/Discussion/Assignment

TEXT BOOKS

1. R. D. Madan, (2013) **Modern Inorganic Chemistry**, S. Chand & Co., New Delhi.
2. B. R. Puri, L. R. Sharma, K. K. Kalia, (2008) **Principles of Inorganic Chemistry**, Milestone Publishers and Distributors, New Delhi.
3. Arun Bahl, B. S. Bahl, (2010) **Advanced Organic Chemistry**, S. Chand & Co., New Delhi.
4. Arun Bahl and B. S. Bahl, G. D. Tuli, (2009) **Essentials of Physical Chemistry**, S. Chand & Co., New Delhi.
5. B. R. Puri, L. R. Sharma, M. S. Pathania, (2009) **Principles of Physical Chemistry**, S. Chand & Co., New Delhi.

REFERENCE BOOKS

1. Sathya Praksash, G.D. Tuli, S. K. Basu, R.D. Madan, (2012) **Advanced Inorganic Chemistry**, Vol. 1, S. Chand & Co., New Delhi.
2. J. D. Lee, (2006) **Concise Inorganic Chemistry**, Black Well Science, UK.
3. M. K. Jain, S. C. Sharma, (2011) **Modern Organic Chemistry**, Vishal Publishing Co., New Delhi.
4. B. Mehta, Manju Mehta, (2005) **Organic Chemistry**, Prentice Hall of India Pvt Ltd., New Delhi.
5. S. Glasstone, D. Lewis, (2004) **Elements of Physical Chemistry**, Macmillan Ltd, London.

19UCH303

MAPPING

| PSO CO | PSO1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|-------------------------|-------------|--------------|--------------|--------------|--------------|
| CO1 | S | S | S | M | H |
| CO2 | S | S | S | H | H |
| CO3 | S | S | S | H | H |
| CO4 | S | S | H | H | M |

S – Strong**H** – High**M** – Medium**L** – Low

Part IV – III Semester**Skill Based Subject I – GENERAL AWARENESS (ONLINE)**

(2014 – 2015 Batch Onwards)

Total Credits: 3**Total Hours : 30****Objectives:**

- **To acquire knowledge in relation to various competitive examinations.**
- **To create awareness about an online examination which is being followed in competitive examinations.**

UNIT I (6 hours)**1. Tamil and other Literatures**

Tamil, English, Christian and Muslim Literatures – Ancient Literature – Bakhti Literature – Epics – Medieval Literature – Modern Literature (Novel, Dramas, Short Stories, Modern Poetry).

2. Economics and Commerce

Basic Economics – Auditing – Management – Capital Market – Foreign Trade – Companies – Banking.

3. Social studies

Indian History – Inventions – Indian Poetry – Constitution - Judiciary – Languages – Literacy – Indian Geography – Lithosphere – Climate – Soil – Agriculture – Population.

UNIT II (6 hours)**4. Numerical Aptitude**

Objective Arithmetic : Number systems – probability – HCF and LCM of numbers - decimal fractions – simplification – squareroots and cuberoots – average – percentage – profit and loss – ratio and proportion – time and work – simple interest – area, volume and surface area.

5. Verbal Aptitude

Spot the odd one out – correct form of verb – preposition – find out the rightly spelt word – choose the correct meaning of idioms – synonyms and antonyms.

6. Abstract Reasoning

Logic Reasoning : Logic – statement – arguments – statement assumptions – Statement course of action – theme detection – deriving conclusion from passages.

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Non – verbal Reasoning : Series – analogy – classification – analytical reasoning – mirror images – water images – paper folding – paper cutting – rule detection – grouping of identical figures.

UNIT III (6 hours)

7. **General Science and Technology**

SCIENCE - Basic principles and concepts in Physics, Chemistry, Botany and Zoology.

TECHNOLOGY - Metallurgy, instrumentation, discoveries and inventions of techniques.

8. **Computer Science**

Historical evolution of computers – Computer applications – Data processing concepts – Computer codes and arithmetic – Hardware components – Data Structures.

9. **Education**

Development process of the learner – Principles of development (physical, social, emotional and intellectual) – Learning process – Teaching and teacher behaviour – Interaction analysis – Microteaching – Teacher as a leader – Motivation – Personality dimension – concept of mental health – Counselling.

UNIT IV (6 hours)

10. **Library and Information Science**

Library and Information Science – Basics, Computer, Library Network and others like Research, Reprography etc.

11. **Sports and Games**

Athletics – Track Events – Field Events – Games – Indoor Games – Outdoor Games – General knowledge – Sport and Olympics – First Aid.

12. **Current Affairs**

State, Central and International affairs: Budgets – Politics – Sports – Education – Commerce and Industry – Inventions – Science and Technology – Currency – Agriculture – Movies – Guinness records – Awards – IT Industry – Space Research – Defence etc.

UNIT V (6 hours)

13. **National Cadet Corps (NCC)**

Introduction to the Armed Forces (Army, Navy, Air Force) – Drill – Weapon Training – Map Reading – Civil Defence.

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14. **National Service Scheme (NSS)**

History of NSS – History of Motto, Symbol, Badge – Aims and Objectives – Duties and Total Hours – Organisational and Administrative setup – History of voluntary organization – Regular activities – Special camp activities – Special programmes – awards – Important days.

15. **Youth Red Cross (YRC)**

History of International Red Cross – History of Indian Red Cross – History of Youth Red Cross – Main objectives of YRC – Emblem – Fundamental principles of Red Cross – Organizational Setup – Activities of Youth Red Cross – Role of different functionaries – Training programmes for YRC Program Officers – Training programme for YRC Volunteers – YRC Song – Working Hours – General orientation – Special orientation – Program skill learning.

Text Book

1. General Awareness, Question Bank, Kongunadu Arts and Science College, Coimbatore, First Edition 2014.
-

Question Paper Pattern

Max. Marks 100

End of Semester Examination (ESE)- On-Line Examination

75 Marks

1. 150 questions are to be given. Each question carries ½ mark.
2. In each unit, 30 questions are to be given, covering all the 5 units.

Continuous Internal Assessment (CIA) (through On-Line)

25 Marks

- a) Two Exams. 15 Marks
- b) Assignment** 5 Marks
- c) Attendance 5 Marks

** Each student has to submit an assignment in the Current Affairs area.

| | | | | |
|------------------------------|----------------|---|-------------------|--------------|
| Programme: B.Sc. | | Title: Chemistry | | |
| Course Code: 19UCH404 | | Title: CORE CHEMISTRY PAPER – IV INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY -IV | | |
| Batch 2019-2020 | Semester IV | Hours / Week 4 | Total Hours 60 | Credits 4 |

Course Objectives

1. To learn group IA elements.
2. To know about preparation and properties of phenols, amines and diazo compounds.
3. To study phase equilibrium- one and two component systems and solutions.

Course Outcomes (CO)

| | | |
|--------|-----|--|
| K2, K3 | CO1 | Gain the knowledge about the properties of alkali metals. |
| K1, K2 | CO2 | Understand the basic aspects of phenols, amines and its derivatives. |
| K1, K2 | CO3 | Analyze and apply phase rule to various systems. |
| K3, K4 | CO4 | Understand colligative properties and their determinations. |

UNIT-I

Group IA elements - Alkali metals

***General properties-electronic configuration, density, molar volume, atomic volume, atomic and ionic radii, heat of atomization, melting and boiling point- ionization energy- electropositive character. Similarities in chemical properties – formation of halides, nitrates, oxides, hydroxides, hydrides. Comparison of Lithium with other members of the family. Anomalous behavior of lithium- diagonal relationship of Li and Mg - Lithium- Extraction, properties and uses.** (12 hours)

UNIT-II

Alcohols : Classification and Nomenclature, **Monhydric Alcohols :** Methods of Formation by Reduction of Aldehydes, Ketones, Carboxylic Acids and Esters, Hydrogen Bonding Acidic Nature, Reactions of Alcohols. **Dihydric Alcohols :** Methods of Formation, Chemical Reactions of Vicinal Glycols, Oxidative Cleavage [Pb(OAc)₄ and HIO₄] and Pinacol Pinacolne Rearrangement. **Trihydric Alcohols :** Methods of Formation, Chemicals Reactions of Glycerol.

UNIT - III

Phenols

Monohydric Phenols - preparation and properties, acidity of phenols, reaction of monohydric phenols - Esterification, Nitration, Sulphonation, Halogenation, coupling with diazonium salts, Kolbe-Schimit, Reimer-Tiemann, Schotten-Baumann, Hoesch-Houben reaction and Gattermann reactions with mechanism, Lederer Manasse reaction, Phenol formaldehyde resin, Phenolphthalein preparation (12 hours)

UNIT-IV**Phase rule and Phase equilibria**

Phase rule-statement- Definition of terms phase, component, and degrees of freedom. Conditions for equilibrium between phases, Derivation of Gibb's Phase rule. Phase diagrams of Water, Carbon dioxide and Sulphur systems. Polymorphism- Two components system: Simple Eutectic systems - Silver-Lead and Zinc - Cadmium system. Formation of compounds with congruent and incongruent melting point (Ferric chloride - water system and Sodium sulfate - water system). (12 hours)

UNIT-V**Solutions**

Introduction- Solution of Gases in Gases-Henry's law-limitations of Henry's law. Solutions of liquids in liquids-solubility of partially miscible liquids. Phenol-water system. Solutions of solids in liquids-solubility- its equilibrium concept.

Dilute Solutions- Colligative properties- lowering of vapour pressure - Raoult's Law - derivation. Ideal solutions and deviations from Raoult's law. Determination of molecular mass from vapour pressure lowering. Elevation of Boiling point relation and determination of molecular mass. Depression of freezing point and determination of molecular mass from depression of freezing point by Rast's Camphor method.

Osmosis - Semipermeable membrane - silica garden and the egg experiment. Osmotic pressure and its determination by modern osmometer - Reverse osmosis. (12 hours)

**self study portion*

Teaching Methods

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment

TEXT BOOKS

1. R. D. Madhan, (2012)**Modern Inorganic Chemistry**, S. Chand and Co.
2. Sathya Praksash, G.D. Tuli, S. K. Basu, R.D. Madhan, (2012) **Advanced Inorganic Chemistry**, Volume 1, S. Chand & Company, New Delhi.
3. Arun Bahl and B.S.Bahl, (2010) **Advanced Organic Chemistry**, S. Chand and Co., New Delhi.
4. B. R. Puri, L.R. Sharma, and S. Pathania, (2008) **Principles of Physical Chemistry**, Shoban Lal Nagin Chand & Co, New Delhi.

REFERENCE BOOKS

1. Lee J.D., (2007) **Concise Inorganic Chemistry**, Black Well Science-Wiley - India, New Delhi.
2. B. Mehta, Manju Mehta, (2005) **Organic Chemistry**, Prentice Hall of India Private Limited, New Delhi.
3. Arun Bahl, B.S. Bahl, G.D. Tuli., (2009) **Essentials of Physical Chemistry** S. Chand and company, New Delhi.

MAPPING

| CO \ PSO | PSO1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|-----------------|-------------|--------------|--------------|--------------|--------------|
| CO1 | S | S | M | M | M |
| CO2 | S | S | M | M | M |
| CO3 | S | S | M | M | M |
| CO4 | S | S | H | H | M |

S – Strong

H – High

M – Medium

L – Low

| | | | | |
|------------------------------|----------------|---|-------------------|--------------|
| Programme: B.Sc. | | Title: Chemistry | | |
| Course Code: 19UCH4S2 | | Title: SKILL BASED SUBJECT-II WATER POLLUTION AND MANAGEMENT | | |
| Batch 2019-2020 | Semester IV | Hours / Week 2 | Total Hours 30 | Credits 3 |

Course Objectives

1. To know about the sources and characteristics of water.
2. To learn about the analysis of the pollutants in water.
3. To learn the methods of purification and management of water.

Course Outcomes (CO)

| | | |
|----|-----|---|
| K1 | CO1 | Understand the importance of water. |
| K2 | CO2 | Studying the different types of water pollution. |
| K4 | CO3 | Analyze and measurement of toxic chemical substances. |
| K2 | CO4 | Gain the knowledge of purification and management of water. |

UNIT-I

Sources of water

Introduction- Sources of water - Types of water- hard and soft water- uses of water – disadvantages of using hard water for domestic purpose- disadvantages of using hard water for various industries - water for industry. Quality of natural waters - Chemistry of water - Water in human body - Water as a solvent - main quality characteristics of water - effects of water on rocks and minerals - organic matter in water - humic material in water - colloidal material in water. (6 hours)

Unit-II

Water pollution

***Definition - water pollutants - types of water pollution - ground water pollution, surface water pollution**, lake water pollution, river water pollution and sea water pollution - physical pollution of water - chemical pollution of water - biological pollution of water – physiological pollution of water. (6hours)

Unit- III

Analysis of a water pollutants

Measurement of water quality by chemical and physical examination of water - Hardness of water- Types of hardness of water (Permanent and temporary hardness) - Chemical substances affecting portability - electrical conductivity - suspended solids - dissolved solids - alkalinity - measurement of toxic chemical substances - general analytical methods of

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determination of metals (Iron and chromium) - international standards for drinking water - dissolved oxygen - biochemical oxygen demand - chemical oxygen demand.
(6 hours)

Unit- IV

Purification of water

Removal of coarse, dispersed and colloidal impurities from water - Coagulation of water - Contact and electrochemical coagulation - Flocculants - Purification or treatment of water for municipal supply (Screening - Aeration - Sedimentation with coagulation- Filtration- Sterilisation and disinfection – Storage and distribution) - Chemical methods of sterilisation - Physical methods of sterilization. Desalination of brackish water - Reverse osmosis.

Zeolite process - Ion exchange method - Demineralization of water - Determination of hardness of water - EDTA method.
(6 hours)

Unit-V

Water management

Introduction - Water management - Use and conservation of water resources - Water quality management - Rain water harvesting - Water from rocks - Water management in agriculture - Rain fed system - Irrigated systems - Sea water for agriculture - Water management in industries.
(6 hours)

**self study portion*

Teaching Methods

PowerPoint presentation/Seminar/Quiz/Discussion/Assignment

TEXT BOOK

1. B.K Sharma, (2003) **Water pollution**, Goel publishing House, Meerut.
2. A. K. Dee ,(2017) **Environmental chemistry**, New age international.

REFFRENCES

1. Jain and Jain, (2001) **Engineering Chemistry**, Dhanpat Rai Publishing Co.,
2. N. Manivasakam (Water Analyst),(2001) **Chemical and Microbiological Analysis of Mineral Water and Packaged Drinking Water**, Principal Public Health Laboratory, Coimbatore.

19UCH4S2

MAPPING

| PSO CO | PSO1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|-----------|------|-------|-------|-------|-------|
| CO1 | H | M | H | M | S |
| CO2 | M | S | S | S | S |
| CO3 | H | S | M | S | S |
| CO4 | M | S | S | M | S |

S – Strong

H – High

M – Medium

L – Low

| | | | | |
|------------------------------|----------------------|--|-------------------|--------------|
| Programme: B.Sc. | | Title: Chemistry | | |
| Course Code: 19UCH4CM | | Title: CORECHEMISTRY PRACTICAL – II INORGANIC VOLUMETRIC AND ORGANIC QUALITATIVE ANALYSIS | | |
| Batch 2019-2020 | Semester III & IV | Hours / Week 3 | Total Hours 90 | Credits 3 |

Course Objectives

1. To demonstrate the concept of quantitative volumetric analysis.
2. To understand the various types of titrimetric analysis.
3. To identify the functional groups of unknown organic compounds.

Course Outcomes (CO)

| | | |
|--------|-----|--|
| K1,K2 | CO1 | Gain the knowledge in principles of volumetric analysis. |
| K2 | CO2 | Estimating the amount of substances present in solutions. |
| K2, K4 | CO3 | Learn to approach a problem systematically and to interpret the results logically. |
| K2, K3 | CO4 | Detect various functional groups present in an organic compound. |

I. Titrimetric Quantitative Analysis**a. Acidimetry and Alkalimetry:**

1. Estimation of HCl by NaOH using a standard Oxalic acid solution
2. Estimation of Na_2CO_3 by HCl using a standard Na_2CO_3 Solution.

b. Permanganometry:

1. Estimation of Oxalic acid by KMnO_4 using a standard Oxalic acid solution
2. Estimation of Iron(II) Sulphate by KMnO_4 using a standard Mohr's Salt solution
3. Estimation of Calcium(II) by KMnO_4 using standard oxalic acid solution

c. Dichrometry:

1. Estimation of Iron (II) by potassium dichromate using standard Mohr's salt solution

d. Iodometry:

1. Estimation of KMnO_4 by Thio using a standard Potassium dichromate Solution
2. Estimation of Copper (II) Sulphate by $\text{K}_2\text{Cr}_2\text{O}_7$ solution.

II. Organic analysis**Analysis of organic compounds**

1. Preliminary tests
2. Detection of elements present
3. Aromatic or Aliphatic
4. Saturated or Unsaturated

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5. Nature of the functional group
6. Confirmatory tests and Preparation of derivatives for the functional groups.

The following functional group compounds may be given:

Aldehydes, Ketones, Amines, Amides, Diamide, Carbohydrates, Phenols, Acids, Esters and Nitro compounds.

BOOKS FOR REFERENCE

1. Venkateswaran. V, Veeraswamy. R, Kulandaivelu. A.R., (1997) **Basic Principles of Practical Chemistry**, NewDelhi, Sultan Chand and Sons.
2. Mendham. J, Denney. R.C, Bames. J.D, and Thomas, M. (1989) **Vogel's Text book of Quantitative Analysis**, Pearson Education.
3. Gopalan. R, Subramaniam. P.S, and Rengarajan. K, (2004) **Elements of Analytical Chemistry**, Sultan Chand and Sons.

Time: 6 hours

Max. Marks : 60

Distribution of Total Marks- 60

| | |
|-----------|----------|
| Record | 10 marks |
| Practical | 50 marks |

Distribution of Practical Marks-50

| | |
|------------------|----|
| Volumetric | 25 |
| Organic Analysis | 25 |

Distribution of Volumetric Analysis Marks-25

| | |
|---|----|
| Procedure (To be written within five minutes) | 5 |
| Experiment | 20 |
| Error up to <2 % | 20 |
| 2 – 3 % | 15 |
| 3 - 4 % | 10 |
| >4 % | 5 |

Distribution of Organic Analysis – 25 Marks

| | |
|--------------------------|---|
| Preliminary Tests | 5 |
| Aliphatic or Aromatic | 3 |
| Saturated or Unsaturated | 3 |
| Special elements | 6 |

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| | |
|------------------|---|
| Functional group | 5 |
| Derivative | 3 |

- **Substance to be given for organic analysis:** Cinnamic acid, Benzoic acid, Succinic acid, Phthalic acid, Aniline, Benzamide, Urea, Benzaldehyde, Acetophenone, Phenol, Cresols, Glucose, Toluidine, Nitrobenzene. Ethylbenzoate.

19UCH4CM

MAPPING

| CO \ PSO | PSO1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|-----------------|-------------|--------------|--------------|--------------|--------------|
| CO1 | S | S | S | S | H |
| CO2 | S | S | H | H | M |
| CO3 | S | S | H | H | H |
| CO4 | S | S | H | S | H |

S – Strong

H – High

M – Medium

L – Low

| | | | | |
|------------------------------|---------------|---|-------------------|--------------|
| Programme: B.Sc. | | Title: Chemistry | | |
| Course Code: 19UCH505 | | Title: CORE CHEMISTRY PAPER – V SPECTROSCOPY | | |
| Batch 2019-2020 | Semester V | Hours / Week 3 | Total Hours 45 | Credits 3 |

Course Objectives

1. To know about the region of electromagnetic spectrum, fundamentals of ultra – violet visible spectroscopy and Infrared spectroscopy.
2. To study Nuclear Magnetic Resonance (NMR) spectroscopy and Mass spectrometry and to interpret and solve problems using various spectra.
3. To have insight about Raman spectral techniques.

Course Outcomes (CO)

| | | |
|--------|-----|---|
| K1,K2 | CO1 | Understand the basic principles, instrumentation of UV-Visible spectroscopy and to utilize their basic aspects to identify various organic compounds. |
| K2 | CO2 | Gain the knowledge in principles, instrumentation and functions of IR and Raman spectroscopy. |
| K2, K4 | CO3 | Study the basic principles and instrumentation of NMR spectroscopy and apply to identify the organic compounds. |
| K2, K3 | CO4 | Know about basic principles and instrumentation of mass spectroscopy technique and the application of various spectral techniques to elucidate the structure of organic molecules. Exploring the various chromatography techniques and their applications in separation of organic mixtures. |

UNIT-I**Ultra – violet and visible spectroscopy**

***Electromagnetic spectrum and absorption of radiations**, Principle of ultraviolet spectroscopy, the absorption laws- Lambert's law and Beer's law. Selection rules, instrumentation – Block Diagram, theory of electronic spectroscopy, types of electronic transitions, the chromophoric concept, auxochromes, absorption and intensity shifts – bathochromic, hypsochromic hyperchromic and hypochromic shifts. Types of absorption bands, solvent effects, Frank – Condon principle. Woodward fisher rules for calculating absorption maximum in dienes. (9 hours)

UNIT-II**Infrared spectroscopy**

Principle of Infrared spectroscopy, molecular vibrations, vibrational frequency, number of fundamental vibrations, overtones and combination bands, selection rules, factors influencing vibrational frequency – coupled vibrations and Fermi resonance, electronic effects, hydrogen

bonding and bond angles. Scanning of infrared spectrum (instrumentation), finger print region. (9 hours)

UNIT – III

Raman spectroscopy

Introduction, Quantum theory of Raman effect, Theory of Raman spectra (Stokes and anti-Stokes lines), Instrumentation, Conditions for Raman spectroscopy, Characteristics Parameters of Raman lines, Raman spectra of diatomic molecules, Rotational – Vibrational Raman spectra, Vibrational Raman spectra of polyatomic molecules, Rules of Mutual exclusion principle, moment of inertia of diatomic molecule and Raman spectroscopy, Infrared and Raman spectra are complementary. (9 hours)

UNIT – IV

Nuclear Magnetic Resonance (NMR) spectroscopy

Principle and theory of NMR spectra, conditions of resonance, relaxation process – spin – spin relaxation, spin – lattice relaxation and quadrupole relaxation. Instrumentation, solvent used in NMR, Chemical shift (shielding and deshielding effects). Number of signals, position of signals, factors influencing chemical shift – inductive effect, van der Waals deshielding, Anisotropy (diamagnetic shielding in benzene), Peak area and proton coupling, spin – spin splitting, splitting of the signals in pure ethanol and chloroethane. (9 hours)

UNIT – V

Mass spectrometry and application of spectroscopic methods

Basic principles, theory of mass spectrometry, meta stable ions or peaks, nitrogen rule, general fragmentation modes of hydrocarbons, Retro – Diels Alder reaction, hydrogen transfer rearrangements and McLafferty rearrangement.

IR, NMR and Mass techniques in the identification of simple organic molecules. (Ethanol and dimethyl ether, acetaldehyde and acetone, ethylene and acetylene). (9 hours)

**self study portion*

Teaching Methods

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment

TEXT BOOKS

1. Y.R, Sharma, (2007) **Elementary Organic Spectroscopy Principles and Chemical Applications**, S.Chand & Company Ltd, New Delhi.
2. Jag Mohan, (2013) **Organic Spectroscopy – Principles and Applications**, Narosa publishing house.
3. Gurdeep R. Chatwal, (2002) **Instrumental Methods of Chemical Analysis**, Himalaya publishing house, Delhi.

REFERENCE BOOKS

1. P.S. Sindhu, Elements of (2007) **Molecular Spectroscopy**, New Age International Publishers, New Delhi.
2. H.S. Randhana, (2003) **Modern Molecular Spectroscopy**, Macmillan India Ltd, New Delhi.

19UCH505

MAPPING

| CO \ PSO | PSO1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|-----------------|-------------|--------------|--------------|--------------|--------------|
| CO1 | S | S | S | H | M |
| CO2 | S | S | M | M | M |
| CO3 | S | S | H | M | H |
| CO4 | S | S | S | H | H |

S – Strong**H** – High**M** – Medium**L** – Low

| | | | | |
|------------------------------|---------------|---|-------------------|--------------|
| Programme: B.Sc. | | Title: Chemistry | | |
| Course Code: 19UCH506 | | Title: CORE CHEMISTRY PAPER – VI INORGANIC CHEMISTRY | | |
| Batch 2019-2020 | Semester V | Hours / Week 4 | Total Hours 60 | Credits 4 |

Course Objectives

1. To understand the key features of coordination compounds, including: the variety of structures, ligands, various theories of coordination complexes, stability of complexes.
2. To know the basics of Organometallic chemistry and instrumental methods of analysis for samples
3. To identify what radioisotopes and acquaint knowledge about nuclear reactions.
4. To describe about Inorganic acids, bases, Inorganic Solvents and Inorganic Polymers.

Course Outcomes (CO)

| | | |
|--------|-----|---|
| K2 | CO1 | Understand the theories of co-ordination compounds. |
| K4, K2 | CO2 | Knowledge about basics organometallic compounds and instrumental methods of chemical analysis |
| K1, K4 | CO3 | Analyze the importance of radioactive isotopes and nuclear reactions. |
| K2, K4 | CO4 | Describe about the different concepts of Inorganic acids, bases, Inorganic Solvents and Inorganic Polymers. |

UNIT – I

Co-ordination Compounds

Co-ordination Compounds – Nomenclature - Werner's coordination theory- Electronic interpretation of coordinate bond by Sidgwick. Isomerism: Examples of geometrical isomerism in square planar and octahedral coordination compounds. Magnetic properties of coordination compounds and their interpretation by Pauling's Valence Bond Theory and Crystal Field Theory. (12 hours)

UNIT - II

Nuclear Chemistry - I

Introduction – Nuclear stability and n/p ratio. Magic numbers. Packing fraction. Mass defect and binding energies. Definition for isotopes, isobars and isotones. Detection of isotopes - mass spectrographs-Thomson's, Dempster's and Aston's mass spectrographs- Importance of discovery of isotopes. Radioactivity –emission of alpha, beta and gamma rays. Radioactive disintegration -first order kinetics - half-life period. Radioactive disintegration series. Uses of radioactive isotopes – medicine – agriculture – C¹⁴ dating – dating of Universe. (12 hours)

UNIT - III

Nuclear Chemistry - II

Nuclear reactions – fission, fusion, spallation, capture and particle-particle reactions - nuclear

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fission-nuclear reactors- Atom bomb- nuclear fusion - Stellar energy- Hydrogen bomb. Artificial transmutation of elements. Artificial radioactivity. ***Atomic power projects in India**- Disposal of nuclear wastes. Problems. (12 hours)

UNIT - IV

Acids and Bases

Different concepts of acids and bases- Arrhenius, Lowry- Bronsted, Lewis, Cady- Esley (solvent system), Lux-Flood and Usanovichs concepts. Conjugate acids and bases- comparison of strengths of Lowry-Bronsted acids - Comparison of strengths of Lewis acids and bases. Levelling effect and levelling solvents. Hard and soft acids and bases (HSABs)- Acid and bases strengths of HSABs- Applications of HSABs concept, Basis of hardness and softness - pi-bonding contributions- electro negativity factor. Limitations of HSAB concept. (12 hours)

UNIT – V: Inorganic Solvents and Inorganic Polymers

Solubilities of compounds- effect of temperature on solubility- chemical structure and solubility. Role of water as solvent. Classification of solvents - properties of ionizing solvents. Types of reactions in solvents. Specific non-aqueous solvents - protic solvents (ammonia) - aprotic solvents (SO₂). Molten salts as solvents. Types of inorganic polymers, comparison with organic polymers, synthesis, structural aspects and applications of silicones and siloxanes. Borazines, silicates and phosphazenes, and polysulphates. (12 hours)

**self study portion*

Teaching Methods

| |
|--|
| Powerpoint presentation/Seminar/Quiz/Discussion/Assignment |
|--|

TEXT BOOKS

1. R. D. Madhan, G. D. Tuli, and S. M. Malik,(2006) **Selected Topics in Inorganic Chemistry**, S. Chand & Co., New Delhi,
2. B. R. Puri, L. R. Sharma, K. K. Kalia, (2008) **Principles of Inorganic Chemistry**, Milestone Publishers and Distributors, New Delhi
3. R. D. Madan, (2004) **Modern Inorganic Chemistry**, S. Chand & Co., New Delhi
4. U. N. Dash, (2010) **Nuclear Chemistry**, S. Chand & Co., New Delhi

REFERENCE BOOKS

1. Karen C.Timberlake,(2005) **Basic Chemistry**, Los Angeles Valley College, Pearson-Benjamin Cummings, San Francisco, First Edition.
2. G. S. Manku,(2006)**Theoretical Principles of Inorganic Chemistry**, Mc - Graw Hill Edition.
3. M. G. Arora, M. Singh, (1998) **Nuclear Chemistry**, Anmol publications Pvt. Ltd., New Delhi.
4. Sathya Praksash, G.D. Tuli, S. K. Basu, R.D. Madhan,(2012) **Advanced Inorganic Chemistry**, Vol. 1, S. Chand & Co., New Delhi.
5. H. J. Arnkar,(2014) **Essentials of Nuclear Chemistry**, New Age International.

MAPPING

| PSO CO | PSO1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|-------------------------|-------------|--------------|--------------|--------------|--------------|
| CO1 | S | S | H | M | H |
| CO2 | S | M | S | M | S |
| CO3 | S | M | S | M | S |
| CO4 | S | S | S | S | S |

S – Strong

H – High

M – Medium

L – Low

| | | | | |
|------------------------------|---------------|---|-------------------|--------------|
| Programme: B.Sc. | | Title: Chemistry | | |
| Course Code: 19UCH507 | | Title: CORE CHEMISTRY PAPER – VII ORGANIC REACTION MECHANISM | | |
| Batch 2019-2020 | Semester V | Hours / Week 4 | Total Hours 60 | Credits 4 |

Course Objectives

1. To study asymmetry and optical activity of organic molecules and basics in carbohydrate.
2. To understand the mechanisms of important organic rearrangements and chemistry of amino acids, proteins and peptides .
3. To study preparation and properties of heterocyclic compounds

Course Outcomes (CO)

| | | |
|--------|-----|---|
| K1,K2 | CO1 | Understanding the fundamental aspects of stereochemistry. |
| K1,K2 | CO2 | Learn about preparation, properties and structural elucidation of carbohydrates. |
| K2, K4 | CO3 | Study on the various naming reactions and their detailed mechanistic pathway. |
| K1, K3 | CO4 | Acquire the knowledge of preparation, synthesis and properties of amino acids, proteins, peptides and heterocyclic compounds. |

UNIT-I

Stereochemistry

***Optical Isomerism**, cause of optical activity, plane polarized light, specific rotation, Plane of symmetry, chiral (asymmetric) carbon atom, chirality, Optical isomerism of lactic acid, Fischer projections and optical isomerism of tartaric acid. Properties of Enantiomers and diastereo isomers. Resolution of Racemic mixture – mechanical separation – kinetic separation – selective adsorption – chemical method – biochemical method. Racemization, chiral (Asymmetric) synthesis, Walden inversion. Specifying absolute configuration – R , S system for asymmetric molecule. Optical activity of Biphenyl, Allenes, Spiranes and over crowded molecules. Geometrical isomerism. (12 hours)

UNIT-II

Carbohydrates - Introduction, classification

Monosaccharides - occurrence, preparation, structural elucidation, properties and uses of Glucose and Fructose. Cyclic form of glucose and fructose. Mutarotation, interconversion of glucose to fructose and vice versa.

Disaccharides – Structure, preparation, properties and uses of sucrose and maltose.

Polysaccharides – starch and cellulose - Manufacture, structure and properties. Derivatives of cellulose. (12 hours)

UNIT-III

Molecular Rearrangements with mechanism

Reaction, mechanism, and applications of molecular rearrangement reactions - Pinacol-Pinacolone, Beckmann, Hoffmann, Curtius, Benzilic acid, Claisen Rearrangements, Cope rearrangement and Fries rearrangement. (12 hours)

UNIT-IV

Amines and Diazo compounds

Preparation and reactions of amines, separation of a mixture of primary, secondary and tertiary amines – comparison of their basicity. Hinsberg test for distinguishing primary secondary and tertiary amines, Ring substitution, Diazotization and coupling reaction of aromatic amines.

Preparation, structure and synthetic applications of Diazomethane. (12 hours)

UNIT-V

Heterocyclic compounds

Introduction- preparation – physical and chemical properties of Furan, Pyrrole, Thiophene, Pyridine, Quinoline and Isoquinoline. (12 hours)

**self study portion*

Teaching Methods

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| Powerpoint presentation/Seminar/Quiz/Discussion/Assignment |
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TEXT BOOKS

1. Arun Bahl and B.S.Bahl, (2012) **Advanced Organic Chemistry**, S. Chand and Co., New Delhi.
2. Gurdeep. R. Chatwal, (2013) **Reaction Mechanism and Reagents in Organic Chemistry**, Himalaya Publishing House Delhi.
3. M.K. Jain, S.C. Sharma, (2011) **Modern Organic Chemistry**, Vishal Publishing Co., New Delhi.

REFERENCE BOOKS

1. M.G Arora, (2008) **Stereochemistry in Organic Compounds**, Anmol Publications Private Ltd New Delhi.
2. Jagdamba Singh and Yadav, (2005) **Organic Synthesis**, Vol. I and II. Pragathi and Prakasam Publishers.
3. I.L.Finar,(2009) **Organic Chemistry**, Vol.I and II, Addison-Wesley Longman.

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MAPPING

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| CO \ PSO | PSO1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|-----------------|-------------|--------------|--------------|--------------|--------------|
| CO1 | S | M | S | M | M |
| CO2 | S | S | S | S | S |
| CO3 | S | S | S | M | M |
| CO4 | S | M | S | M | M |

S – Strong

H – High

M – Medium

L – Low

| | | | | |
|------------------------------|---------------|---|-------------------|--------------|
| Programme: B.Sc. | | Title: Chemistry | | |
| Course Code: 19UCH508 | | Title: CORE CHEMISTRY PAPER - VIII PHYSICAL CHEMISTRY - I | | |
| Batch 2019-2020 | Semester V | Hours / Week 4 | Total Hours 60 | Credits 4 |

Course Objectives

1. To understand the fundamentals of electrochemistry.
2. To know the types and importance of electrodes and electro chemical cells.
3. To study about corrosion, batteries and Electroanalysis.

Course Outcomes (CO)

| | | |
|--------|-----|---|
| K1,K4 | CO1 | Understanding the concept of conductance and its applications. |
| K2 | CO2 | Acquire basic knowledge about electrode potential, electrochemical cell and potentiometric titrations. |
| K2, K4 | CO3 | Understanding the fundamental principles of corrosion, protective coatings electroplating and its significance. |
| K2, K3 | CO4 | Know about basic principles and instrumentation of Electrochemical Power Systems, Polarography and its applications. Gain knowledge about Electro analysis. |

UNIT-I

Fundamentals of Electrochemistry

Introduction-Classification of conductors – Electrolytic conductance-conductivity cell measurement of conductance of solutions – Variation of equivalent conductance with dilutions. Migrations of ions - Transport number – determination by moving boundary method and Hittorf's method – Kohlrausch's law – statement - application. Arrhenius theory of electrolytic dissociation - Ostwald's dilution law and limitations - theory of strong electrolytes: Debye-Huckel – Onsagar theory (elementary treatment only) - Debye – Falkenhagen effect and Wien effect. Applications of conductance measurements: (i) Determination of dissociation constant of a weak organic acid (i) Conductometric titrations – acid-base titration, precipitation titration. (iii) Determination of solubility product of sparingly soluble salt (iv).Determination of ionic product of water. (12 hours)

UNIT - II

Electro Chemical Cells

Galvanic cell- classification of cell – representation of cell – cell terminology. Reversible and irreversible cells - Electrode potentials – types of electrodes and their potentials. Nernst equations - Computation and measurement of cell emf and Weston - Cadmium cell - Single electrode potentials. Determination and significance of electrode potentials - Electrochemical series and its applications- Thermodynamic quantities of cell reactions (ΔG , ΔH and ΔS) (12 hours)

UNIT - III**Electrodes and their types**

pH scale – Buffer solution, Buffer action – Henderson's equation – determination of pH of Buffer solution. Concentration cells with and without transport - Liquid junction potential. Application of EMF measurements – determination of pH using hydrogen, glass and quinhydrone electrode. Potentiometric titrations – acid - base, redox and precipitation. Redox Potentials - redox indicators - diphenyl amine. (12 hours)

UNIT – IV**CORROSION AND PROTECTIVE COATINGS**

***Introduction, Dry or Chemical corrosion, Wet or Electrochemical Corrosion,** Mechanism of Wet of Electrochemical Corrosion, Galvanic (or Bimetallic) Corrosion, Concentration Cell Corrosion, Passivity, Types of Corrosion, Galvanic Series, Factors Influencing Corrosion, Corrosion Control Methods. Protective Coatings, Metallic Coating, Electroplating, Influencing factors, Pretreatment, Electroplating Methods – Cu, Ni, Electroless Plating – Cu, Ni. (12 hours)

UNIT - V**Electrochemical Power Systems and Analysis**

***Introduction – Batteries – Types-** Lead storage cells and Lithium ion cell. Fuel cells - Definition and importance, Hydrogen-Oxygen fuel cell, Hydrocarbon - Oxygen cell. Zinc air battery - Over voltage – Application of over voltage. Polarography – Instrumentation - Advantages of DME-Limiting current, factors affecting limiting current - Ilkovic equation (derivation not necessary) - Half wave potential –Application of polarography. Amperometric Titrations. Bioelectrochemistry – Bioelectrochemical cell - Electrochemical mechanism of Nervous System. (12 hours)

self study portion*Teaching Methods**

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|--|
| Powerpoint presentation/Seminar/Quiz/Discussion/Assignment |
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TEXT BOOKS

1. P. L. Soni. O. P. Dharmarha and U. N. Dash, (2013) **Textbook of physical chemistry**, S. Chand & Co., New Delhi,.
2. B. R. Puri, L. R. Sharma, M. S. Pathania, (2009) **Principles of Physical Chemistry**, S. Chand & Co., New Delhi.
3. B.S. Bahl and G. D. Tuli, and Arun Bahl, (2012) **Essentials of Physical Chemistry**, S. Chand publishing, Revised multicolor edition.
4. P. C. Jain and Monika Jain, (2009) **Engineering Chemistry**, Dhanpat Rai Publishing Co., New Delhi.

REFERENCE BOOKS

1. Karen C. Timberlake, (2005) **Basic Chemistry**, Los Angeles Valley College, Pearson Benjamin Cummings New York.
2. Samuel Glasstone,(2002) **Introduction to Electrochemistry**, EWP Pvt. Ltd.,
3. Syed Aftab Iqbal, (2011)**Text Book of Electrochemistry**, Discovery Publishing house Pvt. Ltd., New Delhi.

19UCH508

MAPPING

| CO \ PSO | PSO1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|----------|------|-------|-------|-------|-------|
| CO1 | S | S | S | S | S |
| CO2 | S | S | H | M | H |
| CO3 | S | S | H | M | H |
| CO4 | S | S | M | M | H |

S – Strong

H – High

M – Medium

L – Low

| | | | | |
|-------------------------------|---------------|---|-------------------|--------------|
| Programme: B.Sc. | | Title: Chemistry | | |
| Course Code: 19UCH5ED3 | | Title: EXTRA DEPARTMENTAL COURSE (EDC) - CHEMISTRY IN DAY TODAY LIFE | | |
| Batch 2019-2020 | Semester V | Hours / Week 2 | Total Hours 30 | Credits 3 |

Course Objectives

1. To gain knowledge about water treatment in industrial plant and its usage.
2. To get the knowledge about industrial fermentation process, oil, wax and soap preparation.
3. To have a holistic idea about food adulteration, food hygiene and paints manufacture.

Course Outcomes (CO)

| | | |
|------------------------|-----|--|
| K1, K2,K3,K4, K5 | CO1 | Basic understanding of water technology and acquire knowledge in the treatment of water for multi-purpose. |
| K2, K3, K4,K5 | CO2 | Study on the manufacture of alcohol and alcoholic beverages. |
| K1, K2,K3,K5 | CO3 | To understand the chemistry involved in manufacture of fatty acids. |
| K2, K3, K4, K5 | CO4 | To design a demonstration, that provides an opportunity to identify adulteration in food standards. Broadening the knowledge about paints and pigments. |

Unit – I

Water Treatment: Introduction – Sources and Uses of Water – Water for Industrial Purposes – Quality of Normal water – water in human body – Hardness of water – Types - Softening of Water – Soda Lime Process, Zeolite, and Ion-exchange Processes (principles only). Demineralization of water – Treatment of Water for Municipal purposes – Desalination of Brackish Water – Electro dialysis – Reverse Osmosis Method (principles only).

Unit – II

Fermentation: Introduction – Conditions for Fermentation – Characteristics of Enzymes – Fermentation Processes – Alcohol Beverages – Wine, Beer- Manufacture of Spirits – Whisky – Wine. Vinegar – Manufacture. Manufacture of Power Alcohol – Alcohol from Molasses, Starch, Hydrocarbon gases – Uses.

Unit – III

Oils, Fats, Waxes and Soap: Waxes – Classification – Solubility – Saponification value – Manufacture of Candles – Hydrocarbon of Candles – Hydrogenation – of Oils – Soaps – Manufacture – detergents – Cleansing Action of Soaps.

Unit – IV

Food Adulteration and Hygiene: Definition of Adulteration Food – Common Adulterants in Different Foods – Toxic Effects of Some Metals and Chemicals – Contamination of Foods with Harmful Microorganisms – ***Detection of Adulteration in Some Common Food items** – ***Food Additives and Preservatives** – Food standards.

Unit – V

Paints: Classification – Requirements of a Good Paint and Importance of pigment volume concentration (PVC) – Paints Failure. Emulsion Paints , Enamels , Lacquers and Varnishes – constituents and Manufacture.

**self study portion*

Teaching Methods

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment

TEXT BOOKS

1. B.K. Sharma, Environmental Chemistry, Krishna Prakasam Medai (P) Ltd., Meerut, 6th Revised Edn., (2001).
2. P.C. Jain and Monika Jain, Engineering Chemistry, Dhanpat Rai & Sons, Delhi
3. M. Swaminathan, Food & Nutrition, Bappco, 2nd ed. (2011).

REFERENCES BOOKS

1. B. Sri Lakshmi, Food Science, New Age, 5th ed. (2011).
2. Jayashree, Applied Chemistry, S. Chand, 3rd ed. (2013).

19UCH5ED3

MAPPING

| CO \ PSO | PSO1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|-----------------|-------------|--------------|--------------|--------------|--------------|
| CO1 | H | S | S | S | S |
| CO2 | H | S | S | S | S |
| CO3 | M | H | S | S | S |
| CO4 | H | H | S | S | S |

S – Strong

H – High

M – Medium

L – Low

| | | | | |
|------------------------------|----------------|--|-------------------|--------------|
| Programme: B.Sc. | | Title: Chemistry | | |
| Course Code: 19UCH609 | | Title: CORE CHEMISTRY PAPER – IX SOLID STATE AND COORDINATION CHEMISTRY | | |
| Batch 2019-2020 | Semester VI | Hours / Week 4 | Total Hours 60 | Credits 4 |

Course Objectives

1. To know about fundamentals of crystallography, defects in crystals, metallic bonding and alloys.
2. To learn about liquid crystals.
3. To study about reactions of complexes and bio-inorganic chemistry.

Course Outcomes (CO)

| | | |
|--------|-----|--|
| K1, K2 | CO1 | Knowing the difference between amorphous and crystalline solids and their arrangement in crystal lattice. |
| K2, K3 | CO2 | Learn about defects in crystals, various theories of metallic bonding and alloys. |
| K2, K3 | CO3 | Decide the various crystal structures using X-ray diffraction techniques and study about liquid crystals. |
| K3, K4 | CO4 | Study about various ligand substitution reactions, electron transfer reactions in complexes and Bio-inorganic Chemistry. |

UNIT-I

Solid state - I

* *Classification of solids (true solids, pseudo solids, crystalline and amorphous solids)*, elements of crystal symmetry, Definition of lattice point, crystal lattice and unit cell. Seven crystal system and 14 Bravais lattices, close packing of identical solid spheres (CCP, FCC, HCP and BCC), Designation of planes in crystals – Miller indices, radius ratio rule and shape of ionic crystal. Number of particles per unit cell and density of crystals. (12 hours)

UNIT II

Crystallography

Study of the following with respect to cubic system: (100), (110) and (111) planes. Inter planar distances – d_{100} , d_{110} , d_{111} - Ratio of inter planar distances ($d_{100} : d_{110} : d_{111}$) X-ray diffraction studies of crystals – Bragg's equation – Bragg method and powder method – crystal structure of NaCl and ZnS. Growth of a crystals from the Melt and the solution. (12 hours)

UNIT III

Solid state - II

1. Defects in crystal – Stiochiometric and non Stiochiometric defects.
2. Metallic bonding- theories- electron gas theory, Valence bond theory, Molecular orbital theory (Band theory) –True metal or conductor, insulators, semi conductors- types of semi conductors- intrinsic and extrinsic, n and p- type.
3. Magnetic properties – paramagenetic and diamagnetic substances- ferromagnetic substances – Antiferromagnetic substances , Ferrimagnetic substances. (12 hours)

UNIT - IV

Reactions mechanism of coordination compounds-

Ligand substitution reactions in octahedral complexes, labile and inert complexes – types and mechanism of substitution reactions – SN_1 and SN_2 type mechanisms – acid hydrolysis reaction – simple acid hydrolysis type and catalysed aquation type, base hydrolysis reaction – SN_2 and SN_1CB mechanism – anation reactions.

Ligand substitution reactions in square planar complexes – trans effect – trans directing series – theories of trans effect – applications of trans effect. (12 hours)

UNIT – V

Bioinorganic chemistry

Porphyrin systems- Structure of myoglobin and hemoglobin. Role of Hemoglobin in biological systems – cooperativity effect – explanation of cooperativity effect in hemoglobin-metallo enzymes –Carbonic anhydrase, inhibition and poisoning of enzymes – role of alkali and alkaline earth metals in biological systems –sodium pump –calcium pump – biological functions and toxicity of some elements – biological fixation of nitrogen. (12 hours)

**self study portion*

Teaching Methods

| |
|--|
| Powerpoint presentation/Seminar/Quiz/Discussion/Assignment |
|--|

TEXT BOOKS

1. Sathya Prakash, G.D. Tuli, S. K. Basu, R.D. Madhan, (2012) **Advanced Inorganic Chemistry**, Volume 1, S. Chand & Company, New Delhi.
2. Wahid Malik, G.D Tuli, R. D. Madhan, (2006) **Selected Topics in Inorganic Chemistry**, S. Chand & Company, New Delhi.
3. B.R.Puri,L.R.Sharma and K.C.Kalia, (2009) **Principles of Inorganic Chemistry** Milestone Publishers, New Delhi.
4. Gurdeep raj, (2011) **Advanced Inorganic Chemistry**, Vol.1 , Goel Publishing House, Meerut.
5. Gurdeep raj, (2010) **Advanced Physical Chemistry** , Vol.1 , Goel Publishing House, Meerut.

REFERENCE BOOKS

1. M.G. Arora, (1997) **Solid State Chemistry**, Anmol Publishing House, New Delhi.
2. R.D.Madhan, (2011)**Modern Inorganic Chemistry**, S.Chand & Company, New Delhi.
- 3.Asim K.Dass, (2007) **Bioinorganic Chemistry**, Books and Allied (p) Ltd, Kolkata.

19UCH609

MAPPING

| PSO CO | PSO1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|-------------------------|-------------|--------------|--------------|--------------|--------------|
| CO1 | S | S | S | M | H |
| CO2 | S | S | H | H | H |
| CO3 | S | S | S | M | M |
| CO4 | S | M | S | S | S |

S – Strong**H** – High**M** – Medium**L** – Low

| | | | | |
|------------------------------|----------------|--|-------------------|--------------|
| Programme: B.Sc. | | Title: Chemistry | | |
| Course Code: 19UCH610 | | Title: CORE CHEMISTRY PAPER – X CHEMISTRY OF NATURAL PRODUCTS | | |
| Batch 2019-2020 | Semester VI | Hours / Week 5 | Total Hours 60 | Credits 4 |

Course Objectives

1. To study about Terpenoids and Alkaloids.
2. To understand about Vitamins and Hormones.
3. To learn about Chemotherapy.

Course Outcomes (CO)

| | | |
|--------|-----|--|
| K2, K3 | CO1 | Study on the classification, structural elucidation and synthesis of few important terpenoids. |
| K2, K3 | CO2 | Learn about structural determination and synthesis of alkaloids. |
| K1, K3 | CO3 | Acquire basic knowledge about vitamins and hormones. |
| K2, K3 | CO4 | Analyze structural aspects, functions and mode of action of various drug molecules. Acquire basic knowledge about green chemistry. |

UNIT –I**Terpenoids**

Terpenoids: Introduction, classification and general methods of isolation. Isoprene rule, structural elucidation and synthesis of Geraniol, terpineol, dipentene and alpha-pinene. (15 hours)

UNIT-II**Alkaloids**

Introduction, classification, general characteristics and general methods of determining structures and Hoffmann's exhaustive methylation. Structural elucidation and synthesis of Nicotine, Coniine, Piperine and Papaverine. (15 hours)

UNIT III**Vitamins and Hormones**

**Introduction, classification, sources of Vitamins and their deficiency diseases.* Structural elucidation and synthesis of Thiamine and Riboflavin.

Hormones -Introduction, structural elucidation and synthesis of adrenaline and thyroxin.

(15 hours)

UNIT-IV**Amino acids , peptides and Proteins.**

1. **Amino acids** – Nomenclature, dipolar nature of amino acids, isoelectric point, methods of preparation – amination of halo acids – Strecker synthesis – Gabrielphthalimide synthesis – Koop synthesis. Physical and chemical properties of amino acids.

2. **Nomenclature of peptides** – peptide linkages, determination of structure of peptides – synthesis of peptides.

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3. **Proteins** - classification based on composition and function. Structure of proteins – primary – secondary and tertiary structure. General properties of proteins. Denature of proteins. Colour test for proteins. (15 hours)

UNIT – V

Chemotherapy

Designation of drugs based on physiological action – functional and formaco dynamic drugs – chemotherapeutic drugs. Definition and two examples each of antibacterial drugs- sulpha drugs and mode of action of sulpha drugs, Antimalarial drugs, Amebicidal drugs, Antiseptics, Anaesthetics, Analgesics , Antibiotics - Penicillin, streptomycin, and tetracyclins. (15 hours)

**self study portion*

Teaching Methods

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment

TEXT BOOKS

1. Arun Bahl and B.S.Bahl, (2012) **Advanced Organic Chemistry**, S. Chand and Co., New Delhi.
2. M. K. Jain and S. C. Sharma, (2011) **Modern Organic Chemistry**, New Delhi.
3. V. Kumar, (2008) **An Introduction to Green Chemistry**, Vishal Publishing Co.
4. V.K. Ahluwalia, (2006) **Green Chemistry**, Ane Books India, New Delhi.

REFERENCE BOOKS

1. Jagdamba Singh and Yadav, (2005) **Organic Chemistry**, Vol. I and II, Pragathi Prakasam Publishers.
2. I. L. Finar, (2010) **Organic Chemistry**, Vol. I and Vol.II, Addison-Wesley Longman.
3. Gurdeep Chatwal, (2013) **Organic Chemistry of Natural Products**, Himalaya Publishing House, New Delhi.
4. Morrison R.T. and Boyd R.N, (2008) **Organic Chemistry** New York, Allyn & Bacon Ltd.

19UCH610

MAPPING

| PSO CO | PSO1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|-----------|------|-------|-------|-------|-------|
| CO1 | S | H | S | M | H |
| CO2 | S | H | H | M | H |
| CO3 | S | H | M | H | S |
| CO4 | S | S | S | S | S |

S – Strong

H – High

M – Medium

L – Low

| | | | | |
|------------------------------|----------------|--|-------------------|--------------|
| Programme: B.Sc. | | Title: Chemistry | | |
| Course Code: 19UCH611 | | Title: CORE CHEMISTRY PAPER - XI PHYSICAL CHEMISTRY - II | | |
| Batch 2019-2020 | Semester VI | Hours / Week 4 | Total Hours 60 | Credits 4 |

Course Objectives

1. To understand the basics and theoretical aspects of Chemical kinetics.
2. To learn about kinetics of thermal and photochemical reactions.
3. To gain knowledge about importance of catalysis, colloids and Liquid state.

Course Outcomes (CO)

| | | |
|--------|-----|---|
| K1,K2 | CO1 | Understand the basic principles, various experimental techniques and theories of chemical kinetics. |
| K2,K4 | CO2 | Gain the knowledge about principles of photochemical and photosensitized process. |
| K2, K3 | CO3 | Study the basic principles and types of catalysis and colloids. |
| K1, K3 | CO4 | Explore the fundamentals of Liquid State |

UNIT- I**Chemical Kinetics-I**

Empirical laws and experimental aspects. Rate law, stoichiometry, order and molecularity of reactions. Setting up and solving simple differential equations for first order, second order, third order and zero order reaction. Expressions for half – life periods of first order, second order, zero order and third order reactions. Determination of order of reactions. Experimental techniques involved in the following kinetics of reaction. Volumetry, Manometry, Dilatometry, Polarimetry and Colorimetry. Typical examples for each of the techniques. (12 hours)

UNIT- II**Chemical Kinetics-II**

Theoretical aspects: Effect of temperature on the rate constant. The activation energy. Significance of free energy of activation. The collision theory of reaction rates and its limitations. The theory of absolute reaction rates (ARRT). Comparison of the collision theory with the absolute reaction rate theory. Lindemann theory of uni-molecular reactions. (12 hours)

UNIT- III**Kinetics of Photochemical Reactions**

Dark reactions - Complex thermal reactions – Thermal chain reaction - the $H_2 - Br_2$ reaction. Absorption of light and photochemical processes – Laws of photochemistry - The Stark–Einstein law of photochemical equivalence. Kinetics of photochemical chain reaction - the H_2 / Br_2 reaction. Quantum yield of photochemical reactions. Comparison of the thermal and photochemical kinetics of the H_2 / Br_2 reaction. Photosensitized reactions – photophysical process, Fluorescence, Phosphorescence and Chemiluminescence. (12 hours)

UNIT- IV**Catalysis and Colloids**

***Catalysis – Types of catalysis – Characteristics of catalytic reactions** Theories of catalysis – Intermediate Compound Formation Theory, Adsorption Theory – Acid-base catalysis – Enzyme catalysis – Mechanism of enzyme catalysis – Electrocatalysis.

***Colloids - Definitions – Classification of colloids** – sols – preparation, and properties Stability of colloids, gold number, associated colloids – Cleansing action of soaps and detergents. Emulsion – types of emulsions, preparation and properties. Gels – types of gels, preparation and properties. Applications of colloids. (12 hours)

UNIT- V**Liquid State and Liquid Crystals**

Intermolecular Forces in Liquids, Dipole-dipole Attractions, London Forces, Hydrogen Bonding Vapour Pressure, Effect of Temperature on Vapour Pressure, Determination of Vapour Pressure The Static Method, The Dynamic Method, Effect of Vapour Pressure on Boiling Points-Surface Tension, Units of Surface Tension, Determination of Surface Tension, Capillary Rise Method, Drop Formation Method, Ring- detachment Method, Bubble Pressure Method – Viscosity, Units of Viscosity, Measurement of Viscosity, Ostwald Method- Effect of Temperature on Viscosity of a Liquid, Refractive Index, Molar Refraction, Determination of Refractive Index

Optical Activity, Specific Rotation, Measurement of Optical Activity. Introduction - Liquid crystals, Vapour pressure-temperature diagrams, Thermography, LCDs and the seven segment cell. (12 hours)

**self study portion*

Teaching Methods

| |
|--|
| Powerpoint presentation/Seminar/Quiz/Discussion/Assignment |
|--|

TEXT BOOKS

1. Arun Bahl and B. S. Bahl, G. D. Tuli, (2012) **Essentials of Physical Chemistry**, S. Chand & Co., Revised multicolor edition.
2. B. R. Puri, L. R. Sharma, and M. S. Pathania, (2009) **Principles of Physical Chemistry**, S. Chand & Co., New Delhi.
3. P. L. Soni, O. P. Dharmarha and U. N. Dash, (2013) **Textbook of Physical Chemistry**, S. Chand & Co., New Delhi.

REFERENCE BOOKS

1. Keith J. Laidler and John H. Meiser,(2006) **Physical Chemistry**, CBS Publishers & Distributors, New Delhi.
2. Gurudeep Raj, (2009) **Advanced Physical Chemistry**, Goel Publishing House, Meerut.
3. K. K. Rohatgi Mukherjee, (2014) **Fundamentals of Photochemistry**, New age International Publishers.

MAPPING

| CO \ PSO | PSO1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|-----------------|-------------|--------------|--------------|--------------|--------------|
| CO1 | S | S | H | M | M |
| CO2 | S | S | S | S | S |
| CO3 | S | S | M | H | M |
| CO4 | S | S | H | M | S |

S – Strong

H – High

M – Medium

L – Low

| | | | | |
|------------------------------|----------------|--|-------------------|--------------|
| Programme: B.Sc. | | Title: Chemistry | | |
| Course Code: 19UCH6S3 | | Title: SKILL BASED SUBJECT - III FOOD CHEMISTRY | | |
| Batch 2019-2020 | Semester VI | Hours / Week 2 | Total Hours 30 | Credits 3 |

Course Objectives

1. To have an idea about food adulteration and food preservation techniques.
2. To understand the chemistry of vinegar, fruit juices, vegetable acids and beverages.
3. To analyse and characterize chemical aspects of milk.

Course Outcomes (CO)

| | | |
|------------------------|-----|--|
| K1, K2,K3,K4, K5 | CO1 | Know about the nutrition values in food, food adulteration, standards of food, contamination and food poisoning. |
| K1, K2, K3, K4,K5 | CO2 | Understand about the different preservatives in packaged food. |
| K1, K2,K3,K4, K5 | CO3 | Acquiring knowledge about amino acids in vegetables, vinegar, fruit juice, pH value and mineral acids in vinegar. Know about characteristics and adulterations in beverages. |
| K2, K3, K4 | CO4 | Understand the detailed information about milk , commercially important dairy products and value added foods. |

UNIT- I

NUTRITION VALUES OF FOOD MATERIALS AND FOOD ADULTRATION

Nutritional values of carbohydrates, vitamins, proteins and fats*Definition – Food standards – Food Standards in India – Standards for ensuring quality of Products – Common adulterants in different foods – Contamination of foods with toxic chemicals, pesticides and insecticides. Contamination of food with harmful micro-organisms – Bacterial infections – Fungal contaminations of foods. (6 hours)

UNIT-II

IMPACT OF FOOD PRESERVATIVES

Introduction –Types of preservation methods - Chemical Preservatives - Cold Storage - Foods preserved in Tinned Iron and Glass Containers - Inspection of Tinned foods - Arsenic in foods - The Gutzeit test for Arsenic – Examination of glucose for the presence of Arsenic, Antimony in beverages. (6 hours)

UNIT-III

AMINO ACIDS IN VEGETABLES, VINEGAR AND FRUIT JUICES

Biological importance of Amino acids – Leucine – Isoleucine – Lysine – Tryptophan. Preparation and properties of Vinegar. Examination of Vinegar – Determination of Total Solids and examination of residue, Total acidity, Mineral acids in Vinegar, Hydrogen ion Concentration, pH Value, Methods of determining pH, detection of mineral acids in Vinegar by pH Value, Alcohol in Vinegar. Fruit Juices and Vegetable Acids: Examination of Lime Juice, Lemon Squash, etc.,

UNIT –IV

COMMERCIALLY IMPORTANT BEVERAGES

Introduction – Types of beverages - Tea - Nature and Properties of Tea - Adulteration of Tea - Tea Infusions. Coffee - Nature and Properties of Coffee - Adulteration of Coffee with Chicory. Cocoa and Chocolate - Nature and properties of Cocoa and Chocolate - Adulteration of Cocoa. Alcoholic Beverages - Introduction - Determination of Alcohol - Proof Spirit - Denaturing of Alcohol.

(6 hours)

UNIT -V

MILK

General characteristics of Cows’ milk – The determination of the specific gravity – use of lactometer – Determination of total solids – Determination of ash – Determination of fat[Gerber,gottlieb – rose, Werner – Schmid and Adams methods] – Calculation of extent of adultration - Determination of total protein – Determination of lactose – Determination of acidity – Added colouring matter in milk – Preservatives in milk [Boric acid,formaldehyde,etc.] – Boiled and pasturised milk – Homogenised milk – Cream – Reconstituted cream – Synthetic cream – Condensed milk – Dried milk.

(6 hours)

**self study portion*

Teaching Methods

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment

TEXT BOOKS

1. C. Kenneth Tinkler and Helen Masters,(2005) **Applied Chemistry**, Vol. II, London.
2. M. Swaminathan, (2003) **Advanced Text Book on Food and Nutrition**, Vol. II, .
3. B. Sri Lakshmi, (2002) **Nutrition science**, New Age International Pvt. Ltd., New Delhi.

REFERENCE BOOKS

1. M. Swaminathan, (2003) **Handbook of Food and Nutrition**, The Bangalore Printing and Publishing Co. Ltd.,
2. B. Sri Lakshmi, (2003) **Food Science**, New Age International Pvt. Ltd., New Delhi.
3. S. D. Venkataiah,(2004) **Nutrition Education**, Anmol Publication Pvt. Ltd.,.

19UCH6S4

MAPPING

| PSO CO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|-----------|------|------|------|------|------|
| CO1 | H | S | S | S | S |
| CO2 | H | H | S | S | S |
| CO3 | H | S | H | S | S |
| CO4 | H | H | S | S | S |

S – Strong

H – High

M – Medium

L – Low

| | | | | |
|------------------------------|--------------------|--|-------------------|--------------|
| Programme: B.Sc. | | Title: Chemistry | | |
| Course Code: 19UCH6CN | | Title: CORECHEMISTRY PRACTICAL – III GRAVIMETRIC ANALYSIS | | |
| Batch 2019-2020 | Semester V & VI | Hours / Week 3 | Total Hours 90 | Credits 3 |

Course Objectives

1. To understand the concept of gravimetric analysis.
2. To get acquainted with the experimental procedure of gravimetric analysis.
3. To determine the quantity of analyte in solution.

Course Outcomes (CO)

| | | |
|--------|-----|---|
| K1, K2 | CO1 | Understand the basic principles of Gravimetric analysis. |
| K2, K4 | CO2 | Understand about the various precipitating agents. |
| K3, K4 | CO3 | Determination of analyte masses through the gravimetric analysis. |
| K4 | CO4 | Improve the accuracy of analysis. |

I. Gravimetric Analysis

1. Estimation of Sulphate as Bariumsulphate.
2. Estimation of Barium as Barium Chromate.
3. Estimation of Lead as Lead Chromate.
4. Estimation of Calcium as Calcium Oxalate.
5. Estimation of Nickel as Nickel Dimethylglyoxime.

REFERENCE BOOKS

1. Venkateswaran.V, Veeraswamy. R, Kulandaivelu. A.R., (1997) **Basic Principles of Practical Chemistry**, New Delhi, Sultan Chand and Sons.
2. Mendham. J, Denney, R.C. Barnes. J.D and Thomas. (2000) M, **Vogel's Text book of Quantitative Analysis**, Pearson Education.
3. Gopalan.R, Subramaniam P.S and Rengarajan. (2004) K, **Elements of Analytical Chemistry**, Sultan Chand and Sons.

UCH 60

Time: 3 hours

Max. Marks : 60

Distribution of Total Marks- 60

| | |
|-------------|----|
| Record | 10 |
| Gravimetric | 50 |

Distribution of Gravimetric Marks-50

| | |
|---|----|
| Procedure (To be written within five minutes) | 5 |
| Experiment | 45 |
| Error up to 2% | 45 |
| 3% | 35 |
| 4% | 25 |
| 5% | 15 |
| >5% | 5 |

- ❖ Proportionate deduction of marks must be made for errors between the limits given above.
- ❖ Examiners should calculate the result of each candidate with the data obtained by the candidate.
- ❖ For each independent arithmetic error deduct 2 marks.
- ❖ For incomplete or wrong calculation deduct 20% of marks eligible for the result as calculated by the examiners.
- ❖ For incomplete or wrong calculation deduct 30% of marks eligible for the result as calculated by the examiners.
- ❖ If there is a difference between the two results, the examiners should consider the one favorable to the candidate.
- ❖ If a candidate is not able to complete the experiment due to accident, award 5 marks.

19UCH6CN

MAPPING

| CO \ PSO | PSO1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|----------|------|-------|-------|-------|-------|
| CO1 | S | S | H | M | H |
| CO2 | S | S | M | H | H |
| CO3 | S | S | H | M | H |
| CO4 | S | S | M | H | H |

S – Strong

H – High

M – Medium

L – Low

| | | | | |
|------------------------------|--------------------|---|-------------------|--------------|
| Programme: B.Sc. | | Title: Chemistry | | |
| Course Code: 19UCH6CO | | Title: CORECHEMISTRY PRACTICAL – IV PHYSICAL CHEMISTRY EXPERIMENTS | | |
| Batch 2019-2020 | Semester V & VI | Hours / Week 3 | Total Hours 90 | Credits 3 |

Course Objectives

1. Transformation of theoretical knowledge gain to practical aspects.
2. To have experience in handling electrical and non-electrical equipments.
3. To determine the strength of various solutions through spectrometric and electrochemical techniques.

Course Outcomes (CO)

| | | |
|--------|-----|---|
| K1, K2 | CO1 | The results of physical chemistry experiments are incorporated in both theoretical and practical aspects. |
| K2, K4 | CO2 | Gain familiarity with a variety of physico-chemical measurement techniques. |
| K3, K4 | CO3 | Interpret data from an experiment, including the construction of appropriate graphs and the evaluation of errors. |
| K4 | CO4 | Obtain the knowledge about the theories of electrolysis and Chemical kinetics. |

Physical Chemistry Experiments

1. Determination of Partition coefficient of Iodine between Carbon tetra chloride and water.
2. Determination of rate constant of acid- catalysed hydrolysis of an (Methyl acetate OR Ethyl acetate)
3. Determination of K_f / Molecular weight by Rast Macro method (Naphthalene, Diphenyl and m-dinitrobenzene as solvents).
4. Determination of Critical solution temperature of Phenol- Water system.
5. Determination of concentration of an electrolyte (NaCl/ KCl/ Succinic acid)
6. Determination of Transition temperature of the hydrated salt (Sodium acetate, Sodium thio Sulphate and $SrCl_2 \cdot 6H_2O$)
7. Phase diagram-Simple Eutectic system
8. Determination of Cell Constant, Specific conductivity and Equivalent conductivity of strong electrolyte
9. Determination of dissociation constant of a weak acid (Acetic acid)
10. Conductometric Titration (Strong acid Vs Strong base)
11. Potentiometric Titration (Acid-Base Titration HCl Vs NaOH)
12. Potentiometric Titration (Redox Titration FAS Vs $KMnO_4$)
13. Estimation of Manganese by colorimetric method.

REFERENCE BOOKS

1. Venkateswaran.V, Veeraswamy. R, Kulandaivelu. A.R., (1997) **Basic Principles of Practical Chemistry**, New Delhi, Sultan Chand and Sons.
2. Gopalan. R, Subramaniam. P.S., and Rengarajan, K.,(2004) **Elements of Analytical Chemistry**, Sultan Chand and Sons.

Time: 3 hours

Max. Marks : 60

Distribution of Physical Practical Marks-60

| | |
|------------|----|
| Record | 10 |
| Experiment | 50 |

Distribution of Marks for each Experiment

1. Equilibrium Constant

| | |
|-----------------------------------|------------|
| For carrying out the experiment | - 13 |
| Remaining Marks given below | - 37 |
| Calculation of [KI] | - 8 |
| Calculation of [I ₂] | - 8 |
| Calculation of [KI ₃] | - 8 |
| Value of equilibrium | |
| Constant error up to 10% | - 13 |
| 10-12% | - 8 |
| 12-14% | - 5 |
| >14% | - No Marks |

2. Strength of KI Solution may be given in the range from 0.02N to 0.06N

| | |
|-----------------------------------|-----|
| Calculation of [KI] | - 8 |
| Calculation of [I ₂] | - 8 |
| Calculation of [KI ₃] | - 8 |
| Calculation | |
| Strength of given [KI] Solution | - 5 |

For wrong calculation of above value, 50% of marks to be deducted for those steps only.

3.HCl or H₂SO₄, 0.5N to be given. If the order of difference between theoretical and candidates value is

Below a factor of 10 Between 10-20 Above 20-37
 - reduce 3 marks for each factor -5 marks

4. Critical Solution Temperature of Phenol-Water system is 67.0 °c

| | |
|---------------------------|-----------------------------------|
| Phenol-Water system | |
| Plot of % Phenol Vs Temp. | -37 |
| Error up to ±3°c | -15 |
| Error up to ±3°c to 15°c | - reduce 3 marks for each percent |
| Above ±15°c | -5 |

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5. Candidate may be instructed to use solutions of strength 1% and below. Unknown solution must be below 0.8%

| | |
|----------------------------------|------|
| Plot of %NaCl Vs Temp | - 20 |
| Determination of % NaCl Solution | - 17 |
| Error up to 1% | - 17 |
| Error up to 1-2% | - 14 |
| Error up to 2-3% | - 10 |
| Error above 3% | - 05 |

6. 0.1N Acetic acid and 0.1N KCl 100ml each to be given

| | |
|--|-----------------------------|
| Calculation of cell constant | - 17 |
| Correct Eq. Conductance of Acetic acid | - 17 |
| Error up to 10% | - 20 |
| Error up to 10% to 20% | - reduce 1 mark for each %. |

7. 0.1N Acetic acid 100ml and 0.1N KCl 100ml to be given

| | |
|---|------|
| Calculation of cell constant | - 13 |
| Correct Eq. Conductance of Acetic acid | - 13 |
| Calculation of dissociation constant | - 10 |
| Reduce marks for errors as in experiment-6 above | |

8. 0.02N HCl may be given

| | |
|--------------------|-----------------------------|
| Error up to 5% | - 37 |
| Error up to 5-10% | - reduce 3 marks for each % |
| Error up to 10-15% | - reduce 3 marks for each % |
| Error above 5% | - 05 |

9. Rast method

| Solvent Kf | Solute |
|---------------------------------|--------------------|
| 1. Naphthalene (6.9°C) | 1. Biphenyl |
| 2. Diphenyl (8-8.4°C) | 2. Naphthalene |
| 3. Diphenyl amine (8.4 – 8.8°C) | 3. Dichlorobenzene |

For each step error has to be worked out

| | |
|--------------------------|------|
| Melting point of solvent | - 07 |
| Error upto $\pm 10\%$ | - 30 |
| Error upto $\pm 20\%$ | - 15 |
| Above 20% | - 05 |

10. Phase diagram.....37

| | |
|-------------------------------|------|
| Melting point of A | - 06 |
| Melting point of B | - 06 |
| Construction of phase diagram | - 09 |
| Eutectic temperature | - 08 |
| Eutectic composition | - 08 |
| Error up to 1% | - 08 |

UCH 64

| | |
|----------------|------|
| Error up to 2% | - 06 |
| Error up to 3% | - 04 |
| Error > 3 % | - 0 |

11. Colorimetric Experiments

| | |
|---------------|------|
| Error upto 1% | - 37 |
| Error upto 2% | - 30 |
| Error upto 3% | - 20 |
| Error > 3% | - 05 |

19UCH6CO

MAPPING

| PSO CO | PSO1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|-------------------------|-------------|--------------|--------------|--------------|--------------|
| CO1 | S | S | S | M | S |
| CO2 | S | S | H | H | S |
| CO3 | S | S | H | H | S |
| CO4 | S | S | S | M | S |

S – Strong

H – High

M – Medium

L – Low

| | | | | |
|------------------------------|--------------------|---|--------------------|--------------|
| Programme: B.Sc. | | Title: Chemistry | | |
| Course Code: 19UCH6CP | | Title: CORECHEMISTRY PRACTICAL – V APPLICATION ORIENTED PRACTICAL | | |
| Batch 2019-2020 | Semester V & VI | Hours / Week 4 | Total Hours 120 | Credits 4 |

Course Objectives

1. To demonstrate the basic laboratory techniques and application oriented physical constants.
2. To prepare organic dyes, organic compounds and home care products.
3. To estimate the hardness of water, DO, available chlorine in bleaching powder and saponification value of an oil.

Course Outcomes (CO)

| | | |
|--------|-----|--|
| K1,K2 | CO1 | Gain the knowledge of physical constants and preparation of dyes. |
| K2 | CO2 | Know about the preparation of organic compounds. |
| K2, K4 | CO3 | Learn about the preparation method of home care products. |
| K2, K3 | CO4 | Learn about estimation of hardness of water, dissolved oxygen, saponification of oil and isolation of citric acid. |

I. Determination of Physical Constants.

1. Determination of Melting point
2. Determination of Boiling point.

II. Preparation of Organic dyes

Preparation of dyes like Methyl Orange, Methyl Red, Azo Amino benzene.

III. Preparation of Organic Compounds

Preparation involving Acetylation, Hydrolysis, Oxidation, Halogenation, Nitration and Benzoylation

IV. Preparation of Home care products

1. Preparation of white phenyl
2. Preparation of soap oil
3. Preparation of detergent powder
4. Preparation of transparent soap
5. Preparation of moisturizing cream

IV. Estimations

1. Estimation of Hardness of water using EDTA
2. Estimation of dissolved oxygen in water
3. Estimation of alkalinity in water
4. Estimation of calcium in limestone by EDTA method
5. Estimation of Total Fatty Matter (TFM) of a soap

UCH 66

6. Estimation of acid value of an oil
7. Estimation of available chlorine in bleaching powder

REFERENCE BOOKS

1. Venkateswaran. V, Veeraswamy. R, Kulandaivelu. A.R., (1997) **Basic Principles of Practical Chemistry**, New Delhi, Sultan Chand and Sons.
2. Mendham. J., Denney. R.C., Bames. J.D. and Thomas, (2000) **M. Vogel's Text Book of Quantitative Analysis**, Pearson Education.
3. Sharma, K.K. and Sharma, D.S. (2005) **Introduction to Practical Chemistry**, Vikas Publishing House, New Delhi.
4. Praveen Kukreja, (2006). **Chemistry Advanced Practical Manual**, Vrinda Publishing (p) Ltd, New Delhi.

Time: 3 hours

Max. Marks : 60

Distribution of Total Marks- (60)

| | |
|-------------------|----|
| Record | 10 |
| Physical Constant | 10 |
| Estimation | 25 |
| Preparation | 15 |

Distribution of Physical Constant Marks- (10)

| | |
|-----------------|----|
| $\pm 2^\circ$ | 10 |
| $\pm 3^\circ$ | 8 |
| $\pm 4^\circ$ | 6 |
| $\pm > 4^\circ$ | 5 |

Distribution of Estimation Marks- (25)

| | |
|----------------|----|
| Error up to 2% | 25 |
| 3% | 20 |
| 4% | 15 |
| 5% | 10 |
| >5% | 5 |

Distribution of Preparation Marks- (15)

| | |
|-----------------------------|----|
| Quantity | 10 |
| Recrystallisation / Quality | 5 |

MAPPING

| CO \ PSO | PSO1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|-----------------|-------------|--------------|--------------|--------------|--------------|
| CO1 | S | S | S | S | S |
| CO2 | S | S | S | S | H |
| CO3 | S | S | S | S | S |
| CO4 | S | S | S | S | H |

S – Strong

H – High

M – Medium

L – Low

UCH 68

| | | | | |
|-------------------------|--|---|-------------------|--------------|
| Programme: B.Sc. | | Title: Chemistry | | |
| | | Title: MAJOR ELECTIVE - I POLYMER TECHNOLOGY | | |
| Batch 2019-2020 | | Hours / Week 3 | Total Hours 45 | Credits 5 |

Course Objectives

1. To know about basics of polymers, polymerization and plastic materials
2. To learn about polymer processing and synthesis of some commercially important polymers and to know about various polymer processes techniques.
3. To know different type of plastics, advancements, disposal, applications

Course Outcomes (CO)

| | | |
|----------------|-----|--|
| K1, K2 | CO1 | Know about the types of polymers, chemical and physical properties, its industrial applications and uses. |
| K2, K3, K4 | CO2 | Understand the various polymerization techniques, processing and different types of individual polymer products. |
| K1, K2, K3, K5 | CO3 | Acquiring knowledge of commercially important polymer products and its applications. |
| K2, K3 | CO4 | know about the recent advances in polymer products and their applications. |

UNIT-I

Introduction to polymers: Genesis of polymers: *Basic concept – monomers and polymers – definition. Classification of polymers – natural and synthetic polymers – organic and inorganic Polymers – Thermoplastic and thermosetting plastics – plastic materials, elastomers, few applications.

Chemistry of Polymerization: Types – Chain polymerization – Free radical polymerization, Ionic polymerization, coordination polymerization. Step Polymerization – polycondensation, poly addition, ring opening. Miscellaneous polymerization reactions – electrochemical. Group transfer polymerization. (9 hours)

UNIT-II

Polymer properties and Reactions

Molecular weight and Size: Average molecular weight - number average - weight average molecular weights – concepts. Sedimentation and viscosity Average molecular weights - Molecular weight and degree of polymerization.

Glass Transition Temperature (T_g): Definition, application of T_g in processing, Transition and Associated properties, Factors influencing the glass transition temperature. Photo oxidative degradation of polymers. (9 hours)

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UNIT-III Polymerization Processing Techniques

Polymer Processing Technology: Introduction to polymer processing-basic concept and applications-Injection Moulding - compression moulding, extrusion process, Blow moulding, Blown film, Rotational Moulding, FRP. (9 hours)

UNIT-IV Chemistry of Commercial Polymers

Chemistry of polymers: Types-engineering and commodity plastics, General methods and preparation Properties of PE, PP, PS, PMMA, polyacetal, PC, polyamides, PVC, PF, UF, epoxy, Teflon. (9 hours)

UNIT-V Recent Advances in Polymers

Polymer and environmental effect-introduction-disposal of polymer waste-recycling system-importance of biopolymers –basis of conducting polymers, introduction to blends and alloys. Application of plastics in various fields-plastic industries in India. (9 hours)

**self study portion*

Teaching Methods

| |
|--|
| Powerpoint presentation/Seminar/Quiz/Discussion/Assignment |
|--|

TEXT BOOK

1. V. R. Gowariker, N.V. Viswanathan and Jayadev Sreedhar, (2012) **Polymer Science**, Revised Edition, New Age International Publishers, New Delhi.

REFERENCE BOOKS

1. F.W. Billmeyer – (1990) **Text Book of Polymer Science**, John Wiley & Sons.
2. J.R. Fried, (2004) **Polymer Science & Technology**, Prentice Hall of India Private Ltd.
3. G.S. Misra, (1997) **Introductory Polymer Chemistry**, New Age International Private Ltd, New Delhi.
4. Sharma. B.K., GOEL Publishing House, Meerut,(1989) **Polymer Chemistry**.
5. Arora. M.G., Singh. M, and Yadav. M.S., (1989) **Polymer Chemistry**, Anmol Publications Private Ltd., New Delhi.

MAPPING

| PSO CO | PSO1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|-----------|------|-------|-------|-------|-------|
| CO1 | S | S | S | S | S |
| CO2 | S | H | S | S | S |
| CO3 | S | S | H | S | S |
| CO4 | S | H | S | H | S |

S – Strong

H – High

M – Medium

L – Low

UCH 70

| | | | | |
|-------------------------|---------------|--|-------------------|--------------|
| Programme: B.Sc. | | Title: Chemistry | | |
| | | Title: MAJOR ELECTIVE - II NANO AND GREEN CHEMISTRY | | |
| Batch 2019-2020 | Semester V | Hours / Week 3 | Total Hours 45 | Credits 3 |

Course Objectives

1. To gain knowledge about in - depth look at the basics of Nano Chemistry and to know the methods to prepare Nano materials.
2. To get the knowledge about Green Chemistry and its limitations.
3. To have a holistic idea about Green solvents in laboratory as well as in Industry and also to study the Reactions and applications of Green Chemistry.

Course Outcomes (CO)

| | | |
|------------------------|-----|---|
| K1, K2,K3,K4, K5 | CO1 | To understand the basics of Nano Chemistry To know the methods to prepare Nano materials |
| K2, K3, K4,K5 | CO2 | To have an idea about Green Chemistry and its limitations |
| K1, K2,K3,K5 | CO3 | To gain knowledge about Green solvents in laboratory and also in Industry |
| K2, K3, K4, K5 | CO4 | To study the Reactions and applications of Green Chemistry |

UNIT - I:

Introduction to Nanoscience: Definition of Nanomaterials – classification (1D, 2D and 3D) with examples - Synthesis top down and Bottom up Approach - Carbon Nanotubes – Types, properties and uses. (9 hours)

UNIT- II:

Preparation of Nanomaterials. Co-precipitation- sol- gel - chemical reduction- photochemical reduction –hydrothermal and solvothermal synthesis. (9 hours)

Unit III:

Green Chemistry: Introduction-definition-***Need for green chemistry**- Goals - Limitations – Progress of Green Chemistry - principles of green chemistry- Concept of Atom economy- Concept of Selectivity. (9 hours)

UCH 71

Unit IV:

Green Solvents: Green solvents – super critical carbondioxide, ionic liquids - Water as greener solvent- reactions in ionic-liquid, solvent free reaction. Solvent less reaction – Microwave reactions – sonications. (9 hours)

Unit-V:

Green Reactions: Green reactions-Aldol condensation (Acid catalyst, Crossed aldol), Claisen rearrangement, Clemmensen reduction, Diels-Alder reaction. (9 hours)

**self study portion*

TEXT BOOKS

1. S. Shanmugam, **Nanotechnology**, M.J.P. Publishers, Chennai, 2010.
2. V. Kumar, **An Introduction to Green Chemistry**, Vishal Publishing Co., 2008.
3. V.K. Ahluwalia, **Green Chemistry**, Ane Books India, New Delhi, 2006.

REFERENCE BOOK

1. G. Cao, **Nanostructures & Nano Materials**, Imperial College Press, U.K, 2004.

MAPPING

| PSO CO | PSO1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|-----------|------|-------|-------|-------|-------|
| CO1 | S | S | S | S | S |
| CO2 | S | H | S | S | S |
| CO3 | S | S | H | S | S |
| CO4 | S | H | S | H | S |

S – Strong

H – High

M – Medium

L – Low

UCH 72

| | | | | |
|-------------------------|--|---|-------------------|--------------|
| Programme: B.Sc. | | Title: Chemistry | | |
| | | Title: MAJOR ELECTIVE - III PHARMACEUTICAL CHEMISTRY | | |
| Batch 2019-2020 | | Hours / Week 3 | Total Hours 45 | Credits 5 |

Course Objectives

1. To know about the common diseases and cure-terms of pharmacology and drug action.
2. To get introduced to chemotherapy – antibiotics.
3. To know the drugs meant for diabetes.

Course Outcomes (CO)

| | | |
|----------------|-----|--|
| K1, K2 | CO1 | gain the knowledge about the common diseases and cure-terms of pharmacology. |
| K2, K3, K4, K5 | CO2 | Understand about chemotherapy – antibiotics. |
| K2, K3, K4 | CO3 | Learn about drugs meant for diabetes. |
| K2, K3, K4 | CO4 | Basic ideas about various health promoting drugs. |

UNIT I

Introduction

Common diseases -infective disease – insect – borne, air borne and water borne - hereditary diseases - Terminology- drug, pharmacology, pharmacognesy, pharmacodynamics, pharmacokinetics, anti metabolites -absorption of drugs-routes of administration of drugs, factors affecting absorption drugs-routes of administration of drugs, factors affecting absorption –Assay of drugs-chemical, biological, immunological assays, LD50 and ED50 therepeutic index, drug dosage. (9 hours)

UNIT II

Drugs

*Various sources of drugs, pharmacologically active constituents in plants, Indian medicinal plants-tulsi, neem, keezhanelli,- their importance-Classification of drugs- biological chemical-mechanism of drug action- Action at cellular and extra cellular sites. Drug receptors and biological responses- Metabolism of drugs through oxidation, reduction, hydrolysis and conjugate processes, factors affecting metabolism. (9 hours)

UNIT III

Chemotherapy

Designation of drugs based on physiological action; Definition and two examples each of Anaesthetics-General, IV and local- Analgesics – Narcotic and synthetic- Antipyretics and anti-inflammatory agents –Antibiotics –Penicillin, streptomycin, chloramphenicol, tetracyclins-Antivirals, AIDS- symptoms, prevention, treatment- Cancer and neoplastic agents. (9 hours)

UNIT IV

Common Body Ailments

Diabetes-Causes, hyper and hypoglycemic drugs- Blood pressure- Systolic & Diastolic Hypertensive drugs- Cardiovascular drugs- anti arrhythmic, anti anginals, vasodilators- CNS depressants and stimulants- Psychedelic drugs, hypnotics, sedatives (barbiturates, LSD)- Lipid profile –HDL, LDL cholesterol, lipid lowering drugs. (9 hours)

UNIT V

Health Promoting Drugs

Nutraceuticals- Vitamins A, B, C, D, E and K micronutrients Na, K, Ca, Cu, Zn, I- Medicinally important inorganic compounds of Al, P, As, Hg, Fe – L examples each their role and applications- Organic Pharmaceutical acids, Agents for Kidney function (Aminohippuric acid), Agents for liver function (Sulfo bromophthalein), Agents for pituitary function (metyrapone)- Organic Pharmaceutical bases-anti oxidants, treatment of ulcer and skin diseases. (9 hours)

**self study portion*

Teaching Methods

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment

TEXT BOOK

1. Jayashree Ghosh, (2006) **Pharmaceutical Chemistry**, S.Chand and Company Ltd., New Delhi.

REFERENCE BOOKS

1. Lakshmi S., (1995) **Pharmaceutical Chemistry**, S. Chand & Sons, New Delhi.
2. Ashutosh Kar, (1993) **Medicinal Chemistry**, Wiley Eastern Ltd., New Delhi.
3. David William & Thomas Lemke, (2005) **Principles of Medicinal Chemistry**, Foyers, BI publishers.
4. Romas Nogrady, (2004) **Medicinal Chemistry**, Oxford University press.

MAPPING

| PSO CO | PSO1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|-----------|------|-------|-------|-------|-------|
| CO1 | H | H | S | S | S |
| CO2 | S | S | S | S | S |
| CO3 | S | S | S | S | S |
| CO4 | S | S | S | S | S |

S – Strong

H – High

M – Medium

L – Low

UCH 74

| | | | | |
|-------------------------|--|--|-------------------|--------------|
| Programme: B.Sc. | | Title: Chemistry | | |
| | | Title: MAJOR ELECTIVE - IV AGRICULTURAL CHEMISTRY | | |
| Batch 2019-2020 | | Hours / Week 3 | Total Hours 45 | Credits 5 |

Course Objectives

1. To know about basics of soil chemistry and the physical properties of soil.
2. To get introduced to chemistry aspects of soil and various nutrients present in soil- waste for one, food for another.
3. To know the chemistry of pesticides, fungicides and herbicides.

Course Outcomes (CO)

| | | |
|---------|-----|---|
| K1, K2 | CO1 | To gain the knowledge about the origin soil. |
| K3, K4, | CO2 | To understand about physical and chemical properties of soil. |
| K2, K4 | CO3 | To learn about plant nutrients. |
| K2, K3 | CO4 | basic ideas about pesticides, fungicides and herbicides. |

UNIT I

Origin of soil

***Definition of soil-origin-igneous-metamorphic and sedimentary rocks-rock systems-weathering of rocks and minerals** - main components of soil-organic, inorganic, liquid and gaseous phase-Minerals of importance with respect to soil, industries and agriculture –Soil formation physical, chemical and biological factors responsible for soil formation-soil forming processes- Core soil groups of Tamilnadu-Soil survey standard soil survey-methods of soil surveys –remote sensing and soil mapping-soil resource management-use of satellite data for source inventory. (9 hours)

UNIT II

Physical Properties of Soil

Physical properties of soil-soil texture and textural classification-pore space-bulk density, particle density –soil structure and soil colour-surface area-soil colloids-plasticity, shrinkage-flocculation and deflocculation-soil air, soil temperature, their importance in plant growth-soil reaction –ion exchange reaction-cation exchange-anion exchange –buffering capacity – hydrogen ion concentration-determination of pH Values-factors affecting soil pH-soil pH and nutrient availability- Soil degradation –causes. (9 hours)

UNIT III

Chemical Aspects of Soil

Origin of problem soils, their properties acid, alkali and saline soils-diagnosis-remediation of acid and salt effected soils –Methods of reaction and after care-Quality of irrigation water – causes for poor quality waters for irrigation, their effects in soil and crops. Soil testing-Concept,objective and basis-soil sampling, tools, collection processing, dispatch of soil and water samples. Soil organic matter-its decomposition and effect on soil fertility-source of organic matter in soil –maintenance

UCH 75

and distribution –soil organism –their role-nitrification-denitrification, nitrogen fixation in soils-biological nitrogen fixation in soils –microbial interrelationship in soil-microbes in pest and disease management-Bio-conversion of agricultural wastes. (9 hours)

UNIT IV

Plant Nutrients

Plant nutrients-macro and micro nutrients-their role in plant growth –sources-forms of nutrient absorbed by plants –factors affecting nutrient absorption-deficiency symptoms in plants-corrective measures-chemicals used for correcting nutritional deficiencies-nutrient requirements of crops, their availability, fixation and release of nutrients. Fertilizers –classification of NPK fertilizers –sources-natural and synthetic –straight –complex –liquid fertilizers, their properties, use and relative efficiency-secondary and micro nutrient fertilizers-mixed fertilizers –principles of fertilizers use –the efficient use of various fertilizers-integrated nutrient management biofertilizers –rhizobium, azospirillum, azotobacter-Blue green algae and azolla production and quality control of bio-fertilizers. (9 hours)

UNIT V

Pesticides, Fungicides And Herbicides

Pesticides: Definition –classification –organic and inorganic pesticides-mechanism of action – Characteristics-Safe handling of pesticides –impact of pesticides on soil, plants and environment – Acts and Laws concerning the pesticides-. **Fungicides** Definition –classification – mechanism of action-Sulphur, copper-mercury compounds, dithanes, dithiocarbamates. **Herbicides:** Definition – Classification-mechanism of action-Arsenic and boron compounds-nitro compounds, chloro compounds, Triazines, propionic acid derivatives, urea compounds. Acaricides-Rodenticides-Attractants-Repellants-Fumigant foliants. (9 hours)

**self study portion*

Teaching Methods

| |
|--|
| Powerpoint presentation/Seminar/Quiz/Discussion/Assignment |
|--|

TEXT BOOKS

1. Biswas ,T.D and Mukeherjee, S.K.(1987) **Textbook of Soil Science**,Tata McGraw – Hill publishing co.
2. Daji, A.J. (1970) **Textbook of Soil Sciences**, Asia Publishing House, Madras.
3. Tisdale. S. L., Nelson. W. L. and Beaton. J. D.(1990) **Soil Fertility and Fertilizers**, Macmillan Publishing Company, New York.

REFERENCE BOOKS

- 1.Hesse, (1971) **A Textbook of Soil Chemical Analysis** P.R. John Murray.
- 2.Buchel, K.H. John Wiley & Sons , (1983) **Chemistry of Pesticides**, New York.
- 3.Sree Ramula, (1979) **Chemistry of Insecticides and Fungicides Chemistry of Insecticides and Fungicides**, U.S. Oxford and IBH Publishing Co., New Delhi.

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MAPPING

| PSO CO | PSO1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|-------------------|-------------|--------------|--------------|--------------|--------------|
| CO1 | H | H | S | S | S |
| CO2 | S | S | S | S | S |
| CO3 | S | S | S | S | S |
| CO4 | S | S | S | S | S |

S – Strong

H – High

M – Medium

L – Low

| | | | | |
|----------------------------|--|---------------------------|-------------------|--------------|
| Programme code : 04 | | B.Sc Chemistry | | |
| | | MAJOR ELECTIVE - V | | |
| | | DAIRY CHEMISTRY | | |
| Batch 2018-2019 | | Hours / Week 3 | Total Hours 45 | Credits 5 |

Course Objectives

1. To know the chemistry of milk and milk products
2. To know the basics of milk proteins, milk lipids, milk carbohydrates, and milk vitamins.
3. To acquire knowledge of dairy products, analyze the constituents of milk products.

Course Outcomes (CO)

| | | |
|---------|-----|--|
| K1, K2 | CO1 | Learning the chemistry of milk and milk products |
| K3, K4, | CO2 | Knowing the basics of milk proteins, milk lipids, milk carbohydrates, and milk vitamins. |
| K2, K4 | CO3 | Understanding the production and composition of milk products. |
| K2, K3 | CO4 | By applying the acquired knowledge of dairy products, analyze the constituents of milk products. |

UNIT - I

Milk: Definition-General composition of milk-physical properties of milk- colour, odour, acidity-natural and developed, specific gravity-Recknagel effect viscosity and conductivity, factors affecting the gross competition of milk, physico-Chemical change taking place in milk due to processing parameters-boiling pasteurization- sterilization and homogenization.

Adulterants, preservatives and neutralizers-example and their detection. Estimation of fat, specific gravity, acidity and total solids in milk.

UNIT - II

Milk lipids-terminology and definitions classification – saponifiable (triglycerodes) and unsaponifiable matters (sterols and cholesterol) phosphor lipids structure and properties (Lecithin and Cephalin) Milk fat constants-refractive index-saponification number, Iodine number, R.M.number, R.M number and polenske number.

Milk proteins-Chemistry of proteins in general structure-N-terminal and Cterminal, hydrogen bond, disulphide bond and salt linkages, outlines of primary, secondary and tertiary structure of proteins. Physical properties of milk proteins- Electrical properties and hydration, solubility. Reaction of milk properties with formaldehyde and ninhydrin. Non-protein nitrogen constituents of milk, effect of heat on milk protein, milk enzyme and functions.

Milk carbohydrate-Lactose-Its structure, solubility, hydrolysis, Oxidation and reduction, Estimation of lactose in milk.

Milk vitamins-water and soluble vitamins, effect of heat and light on vitamins. Ash and mineral matters in milk.

UNIT - III

UCH 78

Creams - Definition-composition-chemistry of creaming process-gravitational and centrifugal methods of separation of cream-Factors influencing cream separation (Mention the factors only)- Cream neutralization. Estimation of fat in cream.

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

Ghee - Major constituents-common adulterants added to ghee and their detection rancidity-definition-types (hydrolytic, oxidative and ketonic) prevention- antioxidants and synergists (natural and synthetic)-Measurements.

UNIT - IV

Fermented milk products - Fermentation of milk-definition, conditions, cultured milk-definition of culture-examples, conditions, types-cultured cream-cultured butter milk-Bulgarius milk-acidophilus milk-yogurt. Racteriophage-definition and its function.

Indigenous products - Definition percentage composition-preparation- physicochemical changes take place during khoa-making-khoa sweet- Gulab jamum, chana sweet-Rossogolla-ingredients and preparation.

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

UNIT - V

Milk powder - Definition-need for making powder-drying process-spray drying, drum drying, jet drying and foam drying-principles involved in each.

Manufacture of whole milk powder by spray drying process-keeping quality of milk powder.

Dairy Detergents - Definition-characteristics-classification-washing procedure (modern method) sterilization-chloramin-T and hypochlorite solution.

REFERENCE BOOKS

1. **Outlines of Dairy Technology**-*Sukumar De*
2. **Principles of Dairy Chemistry**-*Robert Jenness & S.Patarn.*
3. **Indian Dairy products**-*K.S. Rangappa and K.T. Achaya.*
4. **Modern Dairy Products**-*L.M. Lampert.*
5. **Principles of Dairy processing**-*Warner.*

MAPPING

| CO \ PSO | PSO1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|----------|------|-------|-------|-------|-------|
| CO1 | H | H | S | S | S |
| CO2 | S | S | S | S | S |
| CO3 | S | S | S | S | S |
| CO4 | S | S | S | S | S |

S – Strong

H – High

M – Medium

L – Low

UCH 79

| | | | | |
|----------------------------|--|--|-------------------|--------------|
| Programme code : 04 | | B.Sc Chemistry | | |
| | | MAJOR ELECTIVE - VI LEATHER CHEMISTRY | | |
| Batch 2018-2019 | | Hours / Week 3 | Total Hours 45 | Credits 5 |

Course Objectives

1. To obtain the knowledge on the structure and composition of the hides, skin and Leather.
2. To know the basic principles involved in the pre-training methods of leather manufacture.
3. To understand the problems caused by tannery effluents and to develop the method to dispose the tannery waste in safe manner.

Course Outcomes (CO)

| | | |
|---------|-----|--|
| K1, K2 | CO1 | Learning the basic principles involved in the pre-training methods of leather manufacture. |
| K3, K4, | CO2 | Understanding the different types of tanning and the physico-chemical principles. |
| K2, K4 | CO3 | Widening a skill on the preparation and chemistry of chrome tanning liquids and their factors involving in it. |
| K2, K3 | CO4 | Gaining the broad idea on the chemical methods of curing and preserving the hides in different medium. |

UNIT - I

Introduction-chief process used in leather manufacture. Hides, Skins, Leather – An elementary knowledge of the structure and composition of hides and skins. Proteins and their characteristics, Anatomy and histology of protein constituents of leather (an elementary concept).Basic principles involved in pre-training such as soaking, lining, deliming, bating, pickling and depickling.

UNIT - II

Types of tanning – vegetable and mineral tanning, different types of vegetable tanning–materials classification and chemistry of vegetable tanning. Factors and Physico-chemical principles involved in vegetable tanning, Fixation of vegetable tanning. Synthetic tanning – their classifications, general methods of manufacture and use.

UNIT - III

The preparation and chemistry of chrome tanning liquids, Olation, Oxolation and hydrolysis of chrome liquids. Effect of adding tanning agents – Role of pH in the reaction of chromium complexes with hide proteins. Factors governing chrome tanning- chemistry of neutralization process. A brief survey of chemistry of other tanning materials like Al, Zr and Te salts and their relative merit in contrast with chrome tanning. Chemistry of combination of tannages involving vegetable tanning aldehyde chrome and other tanning agents.

UNIT - IV

Chemical methods of curing and preservation of hides and skins in acid and alkaline solutions. Principles of Analytical methods employed in curing, liming, deliming, bating, pickling. Analysis of vegetable tanning materials and extract. Process of dyeing leather – use of mordant, dyeing auxiliaries such as leveling, Wetting and dispersing agents – dye fixations.

UNIT - V

Animal by-products – their collection, handling and preservation methods (such as hair, blood, bones, glands, keratinous materials and their utilization). Tannery effluents and treatment: Types of water pollution – physical, chemical, physiological and biological. Different types of tannery effluents and waste- beam-house waste – liquors – tanning and finishing yard waste liquors, solid waste – origin and disposal.

TEXTBOOKS

1. *B.K.Sharma, (2008), Industrial chemistry, Goel publishing House, Meerut.*
2. *Jayashree Ghosh, Reprint 2008, Fundamental Concepts of Applied Chemistry, S.Chand & Company Ltd*
3. *P.C.Jain, M.Jain, (2007), Engineering Chemistry, Dhanpat Raj Publishing Company Pvt Ltd, 15th Edn*

MAPPING

| CO \ PSO | PSO1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|-----------------|-------------|--------------|--------------|--------------|--------------|
| CO1 | H | H | S | S | S |
| CO2 | S | S | S | S | S |
| CO3 | S | S | S | S | S |
| CO4 | S | S | S | S | S |

S – Strong

H – High

M – Medium

L – Low

UCH 81

SEMESTER – III

PART IV -NON MAJOR ELECTIVE –I HUMAN RIGHTS

Total Hours: 30

Total Credits : 2

Objectives:

1. To prepare for responsible citizenship with awareness of the relationship between Human Rights, democracy and development.
2. To impart education on national and international regime on Human Rights.
3. To sensitive students to human suffering and promotion of human life with dignity.
4. To develop skills on human rights advocacy
5. To appreciate the relationship between rights and duties
6. To foster respect for tolerance and compassion for all living creature.

UNIT – I

Definition, Meaning, Concept ,Theories and Kinds of Human Rights- Evaluation and Protection of Human Rights in India- Development of Human Rights under the United Nations.

UNIT – II

United Nations Charter and Human Rights - U.N.Commission on Human Rights- Universal Declaration of Human Rights - International Covenant on

- Civil & Political Rights
- Economic, Social and Cultural Rights

UNIT – III

Human Rights and Fundamental Rights (Constitution) - Enactments regarding Human Rights Laws in India - National Human Rights Commission and State Human Rights Commission.

UNIT – IV

Aged persons and their Human Rights - Human Rights of Persons with Disabilities - Tribal Human Rights in India - Three Generation Human Rights.

UNIT – V

Rights of Women, Child, Refugees and Minorities - Media and Human Rights - NGO's in protection of Human Rights - Right to Election

Text Books

1. Human Rights

Compiled by Dr.V.Sugantha, Dean(Unaided),
Kongunadu Arts and Science College,
Coimbatore –29.

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Book for Reference:

1. Human Rights,
Humanitarian Law and
Refugee Law
Jaganathan, MA., MBA., MMM., ML., ML.,
J.P. Arjun Proprietor, Usha Jaganathan
law series, 1st floor, Narmatha Nanthi Street,
Magathma Gandhi Nagar, Madurai – 625014.
Publisher : United Nations.
New York., 1999.
2. Promoting Women's Rights
As Human Rights

Question Paper Pattern (External only)

Duration: 3 hrs

Max: 75 marks

Section A (5x5=25)

Short notes

Either – Or/ Type - Question from each unit

Section B (5X10=50)

Essay type

Either – Or/ Type - Question from each unit

SEMESTER-IV

NON MAJOR ELECTIVE-II WOMEN'S RIGHTS

Total Hours: 30

Total Credits: 2

OBJECTIVES:

- To know about the laws enacted to protect women against violence.
- To impart awareness about the hurdles faced by women.
- To develop a knowledge about the status of all forms of women to access to justice.
- To create awareness about women's rights.
- To know about laws and norms pertaining to protection of women.
- To understand the articles which enables the women's rights.
- To understand the Special Women Welfare laws.
- To realize how the violence against women puts an undue burden on health care services.

Unit I

6hrs

Laws, Legal System & Change

Definition- Constitutional law, CEDAW and international human rights-law and norms-laws and social context-constitutional and legal frame.

Unit II

6hrs

Politics of Land and Gender in INDIA

Introduction-faces of poverty-land as productive resources-locating identities-women's claim to land –rights of properties-case studies.

Unit III

6hrs

Women's Rights: Access to Justices

Introduction-criminal law-crime agent women-domestic violence-dowry related harassment and dowry deaths-molestation-sexual abuse and rape-loopholes in practice-laws enforcement agency.

Unit IV

6hrs

Women's Right

Violence against-women-domestic violence-the protection of women from domestic violence act, 2005-The Marriage Validation Act, 1982-The Hindu Widow Re-marriage Act, 1856 - The Dowry Prohibition Act, 1961.

Unit V

6hrs

Special Women Welfare Law

Sexual harassment at work place-rape and indecent representation-the indecent representation act, 1956-acts enacted for women development and empowerment-role of rape crisis center.

Book for study : Published by Kongunadu Arts & Science College, 2011.

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Books for reference:

1. Good Women do not Inherit land Nitya Rao, Social Science Press and Orient Blackswan (2008).
2. Knowing Our Rights An Impart for Kali for Women (2006). International solidarity network.
3. Women Rights P.D.Kaushik, Bookwell Publications (2007).
4. Violence Protective Measures for Aruna Goal, Women Development and Empowerment Deep and Deep Publications Pvt. (2004).
5. Gender Justice Monika Chawla, Deep and Deep Publications Pvt. (2006).
6. Domestic Violence Against Women Preeti Mishra, Deep and Deep Publication Pvt. (2007).
7. Violence against Women Clair M. Renzetti, Jeffrey L. Edleson, Raquel Kennedy Bergen, Sage Publications (2001).

Question paper pattern

(External Only)

Duration: 3 hrs

Max: 75 Marks

Section A (5 x 5=25)

Short notes

Either – or / type – question from each unit.

Section B (5 x 10=50)

Essay type

Either – or / type – question from each unit.

| | | | | |
|-------------------------|--|-------------------------|-------------|---------|
| Programme: B.Sc. | | Title: Chemistry | | |
| | | Title: Project | | |
| Batch | | Hours / Week | Total Hours | Credits |
| 2019-2020 | | 2 | 30 | 5 |

MARKS DISTRIBUTION

| | Marks |
|----------------|-------|
| Project Report | 60 |
| Viva-Voce | 20 |
| Internal | 20 |
| Total | 100 |

Job Oriented Course (JOC) - TEXTILE CHEMISTRY**Course Objectives**

1. To know about manufacture and properties of natural fibres (vegetable fibres, animal fibres) and synthetic fibres.
2. To learn preparatory process before dyeing.
3. To know the principles of bleaching and dyeing.

Course Outcomes (CO)

| | | |
|---------|-----|---|
| K1, K2 | CO1 | Gain the knowledge about both synthetic and natural fibres. |
| K3, K4, | CO2 | Understand about scouring and desizing. |
| K2, K4 | CO3 | Learn about bleaching. |
| K2, K3 | CO4 | Basic ideas about dyeing. |

UNIT I***Vegetable Fibres And Animal Fibres***

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. (9 hours)

UNIT II***Regenerated And Synthetic Fibres***

Rayon –different types of rayon and their sources-manufacture of viscose rayon- physical and chemical properties- acetate rayon –manufacture –properties, enprammonium rayon – manufacture and properties. Manufacture – properties and uses of polyamides- polyester- polypropylene and polyacrylonitrile. (9 hours)

UNIT III***Preparatory Process Prior To Dyeing***

Scouring: Objective of scouring –process of caustic scouring on open kier machine with sine diagram, scouring with NaOH and Na₂CO₃ -Precautions to be taken before scouring. Desizing using malt extract-merits and demerits of acid and enzyme desizing Singeing –Impurities present in grey cotton and cotton fabric –objects of singeing –process of singeing on gas singeing machine – precautions to be taken during gas singeing. (9 hours)

UNIT IV***Principles of Bleaching***

Principles of wetting and mechanism of detergency –synthetic detergents –surface active agents-bleaching processes –bleaching agents-H₂O₂, NaOCl, bleaching powder and bio-bleaching and their properties-bleaching of cotton, rayon, wool and synthetic fibres. (9 hours)

UNIT V

Principles of Dyeing

Colour and chemical constitution –Chromophore and auxochromes-natural and synthetic dyes-dyes –classification, synthesis of dye shift- congo red, bismark brown and erifstal violet, theories of dyeing –effect of temperature and salt on dyeing –dyeing of wool, silk and poly-esters-dyeing of cotton with reactive dyes- fastness properties –washing, light, rubbing and perspiration. (9 hours)

TEXT BOOKS

1. Shenai. V.A., (1991) **Chemistry of Dyes and Principles of Dyeing Vol. II**, Mahajan Publishers, Ahmedabad.
2. Gopalakrishnan. R. (1988) **Textile Fibres SSM**, Institute of Textile Technology, Mahajan Publishers, Ahmedabad.

REFERENCE BOOKS

1. Shenai. V.A. (1991) **Textile Fibres (Vol. I)**, Mahajan Publishers, Ahmedabad.
2. Shenai. V.A., (1998) **Technology of Beaching**, Mahajan Publishers, Ahmedabad.

MAPPING

| PSO CO | PSO1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|-------------------------|-------------|--------------|--------------|--------------|--------------|
| CO1 | M | S | S | S | M |
| CO2 | H | S | S | S | M |
| CO3 | H | S | S | S | M |
| CO4 | H | S | S | S | H |

S – Strong

H – High

M – Medium

L – Low

| | | | | |
|--|-------------------|---|-------------------|--------------|
| Programme: B.Sc. | | Title: Bio Technology (I Year), Physics (II year), Botany (II Year), Bio-Chemistry (II Year) | | |
| Course Code: 19UCH1A1/19UCH2A1 | | Title: ALLIED CHEMISTRY PAPER - I | | |
| Batch 2019-2020 | Semester I/III | Hours / Week 4 | Total Hours 60 | Credits 4 |

Course Objectives

1. To understand the fundamentals of Chemical bonding.
2. To study Hybridizations, asymmetry and optical activity of organic molecules.
3. To study the basic principles of thermodynamics and electrochemistry.

Course Outcomes (CO)

| | | |
|--------|-----|--|
| K1,K2 | CO1 | Understanding the fundamental aspects of chemical bonding and interhalogen compounds. |
| K1,K2 | CO2 | Learn about the fundamental aspects of Hybridization, stereochemistry which includes asymmetric carbon, optical isomerism, resolution and Geometrical isomerism. |
| K2, K4 | CO3 | Study on the various concepts in Thermodynamics and electrochemistry. |
| K1, K3 | CO4 | Acquiring knowledge about Fuel gases and fertilizers. |

UNIT-I

Concepts of Chemical bond

1. Chemical Bonding - Molecular orbital theory- bonding, anti bonding and non - bonding molecular orbitals - Energy order of MO's - Diamagnetism and Para magnetism - Bond order -Molecular orbital configuration of H₂, N₂, O₂ and F₂.
2. Inter halogen Compounds - Types of Inter halogen Compounds. Preparation, properties, uses and Structures of ICl, BrF₃ and IF₅.
3. Compounds of Sulphur - Preparation, properties, uses and Structures of Sodium hydrosulphite and Peroxides of Sulphur. (12 hours)

UNIT-II

Hybridisation and isomerism in compounds

1. Hybridization - Hybridization of methane, ethene, acetylene, benzene -Classification of reagents - Electrophiles, nucleophiles and free radicals - Classification of reactions - Substitution, addition, elimination, isomerisation, polymerization and condensation.
2. Optical isomerism- Symmetry, elements of symmetry, cause of optical activity Optical isomerism of lactic acid and tartaric acid - Racemisation, Resolution.
3. Geometrical isomerism of maleic acid and fumaric acid. (12 hours)

UNIT-III**Energetics**

Introduction - Scope and limitations - Basic terms - system, surroundings - Types of system, state of system, state variables. Thermodynamic processes - Isothermal, Adiabatic, Isobaric, Isochoric and cyclic processes - Reversible and irreversible processes - Spontaneous process. First law of thermodynamics - Mathematical formulation-limitations. Need for Second law - various statements of second law. Joule - Thomson effect. Enthalpy - Free energy change. (12 hours)

UNIT-IV Electrochemistry

Introduction - Electrolysis - Conductance of electrolytes - Specific conductance, equivalent conductance, molar conductance - Kohlrausch law - Applications - Determination of degree of dissociation - Conductometric titrations. Buffer Solutions and pH: Buffer solutions- buffer action - Determination of pH of buffer solutions - Buffer solutions in living systems. pH definition - Determination by Colorimetric (indicator) method and electrometric method (Conductometric) only. Principles of electroplating and its uses. (12 hours)

UNIT-V**Industrial Chemistry**

1. Fuel gases - Qualities of good fuel. Advantages of gaseous fuels over solid and liquid fuels. Short accounts of natural gas, water gas, semi water gas, carburetted water gas, producer gas and oil gas (manufacturing details not required).

2. Fertilizers - Role of the nutrient elements Nitrogen, Phosphorus and Potassium in plants. Qualities of good Fertilizer, Short accounts of ammonium sulphate, Urea, CAN, Calcium super phosphate, Triple super phosphate and Potassium nitrate (manufacturing details not required).

(12 hours)

**self study portion*

Teaching Methods

| |
|--|
| Powerpoint presentation/Seminar/Quiz/Discussion/Assignment |
|--|

TEXT BOOKS

1. Arun Bahl and B.S.Bahl, (2012) **Advanced Organic Chemistry**, S. Chand and Co., New Delhi,
2. Gurdeep. R. Chatwal,(2013) **Reaction Mechanism and Reagents in Organic Chemistry**, Himalaya Publishing House Delhi
3. M.K. Jain, S.C. Sharma, (2011) **Modern Organic Chemistry**, Vishal Publishing Co., Delhi

REFERENCE BOOKS

1. M.G Arora, (2008) **Stereochemistry in Organic Compounds**, Anmol Publications Private Ltd New Delhi.
2. Jagdamba Singh and Yadav,(2005) **Organic Synthesis**, Vol. I and II. Pragathi and Prakasam Publishers.
3. I.L.Finar, (2009) **Organic Chemistry**, Vol.I and II, Addison-Wesley Longman.

MAPPING (Physics)

| CO \ PSO | PSO1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|-----------------|-------------|--------------|--------------|--------------|--------------|
| CO1 | S | M | M | M | M |
| CO2 | S | H | M | H | M |
| CO3 | S | M | M | M | M |
| CO4 | S | H | H | H | H |

S – Strong **H** – High **M** – Medium **L** – Low

MAPPING (Bio-Chemistry)

| CO \ PSO | PSO1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|-----------------|-------------|--------------|--------------|--------------|--------------|
| CO1 | S | M | M | M | M |
| CO2 | S | M | M | H | H |
| CO3 | S | M | M | H | M |
| CO4 | S | H | H | H | H |

S – Strong **H** – High **M** – Medium **L** – Low

MAPPING (Botany)

| CO \ PSO | PSO1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|-----------------|-------------|--------------|--------------|--------------|--------------|
| CO1 | S | H | M | M | M |
| CO2 | S | H | M | H | H |
| CO3 | S | M | H | H | M |
| CO4 | S | H | H | H | H |

S – Strong **H** – High **M** – Medium **L** – Low

MAPPING (Bio – technology)

| CO \ PSO | PSO1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|-----------------|-------------|--------------|--------------|--------------|--------------|
| CO1 | S | H | M | H | M |
| CO2 | S | S | H | H | H |
| CO3 | S | H | M | H | M |
| CO4 | S | H | H | M | H |

S – Strong **H** – High **M** – Medium **L** – Low

UCH 91

19UCH1A2/19UCH2A2

| | | | | |
|--|-------------------|--|-------------------|--------------|
| Programme: B.Sc., | | Title: Bio Technology(I Year), Physics(II year), Botany(II Year), Biochemisrty(II year) | | |
| Course Code: 19UCH1A2/19UCH2A2 | | Title: ALLIED CHEMISTRY PAPER - II | | |
| Batch 2019-2020 | Semester II/IV | Hours / Week 4 | Total Hours 60 | Credits 4 |

Course Objectives

1. To know the fundamentals of Coordination compounds.
2. To learn about some natural products, amino acids and proteins.
3. To study about chemical kinetics and synthetic polymer.

Course Outcomes (CO)

| | | |
|--------|-----|--|
| K1,K2 | CO1 | Understanding the fundamental aspects and applications of coordination chemistry. |
| K1,K2 | CO2 | Study on the various heterocyclic compounds, carbohydrates and amino acids which include their classification, preparation and properties. |
| K2, K4 | CO3 | Know about the rates of the reaction. |
| K1, K3 | CO4 | Acquire the knowledge about of synthetic polymers, fibres and plastics. |

UNIT-I

Coordination compounds

1. Addition compounds - double salts and complexes.
2. Complexes (Mononuclear complexes only)
 - (i) General aspects- central metal atom, Ligand- types of ligands. Coordination number of central metal atom, oxidation number of central metal atom – Nomenclature (IUPAC system)
 - (ii) Theories of Complexes - Werner's theory, Sidgwick theory - EAN, EAN rule, Pauling's theory - Diamagnetic and paramagnetic complexes- explanation with four and six coordination complexes.
 - (iii) Chelation- Meaning, examples, EDTA applications.
 - (iv) Biological role of Hemoglobin and Chlorophyll
 - (v) Applications of complexes in qualitative and quantitative analysis. (12 hours)

UNIT-II Chemistry of Natural Products

1. Heterocyclic compounds – Nomenclature - Preparation - Properties and uses of Furan, Thiophene, Pyrrole and Pyridine. Comparison of the basicities of Pyrrole and Pyridine with amines.
2. Carbohydrates- Classification - Preparation and reactions of glucose and fructose - Inter conversion of glucose to fructose and vice versa. (12 hours)

UNIT-III

Amino acids

1. ***Amino acids – Classification** - Preparation - Gabriel Phthalimide synthesis, Strecker synthesis, Amination of α - halo acid-properties.
2. Preparation of Peptides - Bergmann method.
3. Nucleic acids - DNA, RNA their components and biological function. (12 hours)

UNIT-IV

Chemical Kinetics - Rate of chemical reaction - units of rate - Factors influencing rate of a reaction -rate equation - rate laws - Rate constant- unit of rate constant - Determination of rate constant of a reaction. Order of a reaction - integrated rate expression for first, second and zero order reactions - examples. Determination of order of reactions - Integrated method, Half - life method, Graphical method, Oswald's method. Molecularity of a reaction - Pseudo unimolecular reaction- Difference between order and molecularity of a reaction. (12 hours)

UNIT-V

Synthetic polymers – Nomenclature, Types of polymers – Addition and condensation polymerization.

Synthetic fibers – **Important requirement of a fiber* , difference between natural and synthetic fiber, properties of synthetic fiber, Preparation of nylon 6 and nylon 6,6.

Synthetic plastics – Classification , thermosetting and thermoplastic plastics – differences, properties. (12 hours)

**self study portion*

Teaching Methods

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment

TEXT BOOKS

1. Arun Bahl and B.S.Bahl,(2012) **Advanced Organic Chemistry**, S. Chand and Co., New Delhi,
2. Gurdeep. R. Chatwal, (2013) **Reaction Mechanism and Reagents in Organic Chemistry**, Himalaya Publishing House Delhi
3. M.K. Jain, S.C. Sharma, (2011) **Modern Organic Chemistry**, Vishal Publishing Co., Delhi,

REFERENCE BOOKS

1. M.G Arora,(2008) **Stereochemistry in Organic Compounds**, Anmol Publications Private Ltd New Delhi
2. Jagdamba Singh and Yadav,(2005) **Organic Synthesis**, Vol. I and II. Pragathi and Prakasam Publishers, 1st Edition.
3. I.L.Finar,(2009) **Organic Chemistry**,Vol.I and II, Addison-Wesley Longman.

MAPPING (Physics)

| CO \ PSO | PSO1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|-----------------|-------------|--------------|--------------|--------------|--------------|
| CO1 | S | H | M | H | M |
| CO2 | S | S | H | H | H |
| CO3 | S | H | M | H | M |
| CO4 | S | H | H | M | H |

S – Strong **H** – High **M** – Medium **L** – Low

MAPPING (Bio-Chemistry)

| CO \ PSO | PSO1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|-----------------|-------------|--------------|--------------|--------------|--------------|
| CO1 | S | H | M | H | M |
| CO2 | S | M | H | M | H |
| CO3 | S | H | H | H | M |
| CO4 | S | H | H | M | M |

S – Strong **H** – High **M** – Medium **L** – Low

MAPPING (Botany)

| CO \ PSO | PSO1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|-----------------|-------------|--------------|--------------|--------------|--------------|
| CO1 | S | M | M | H | H |
| CO2 | S | S | H | M | H |
| CO3 | H | H | H | H | M |
| CO4 | S | H | H | M | H |

S – Strong **H** – High **M** – Medium **L** – Low

MAPPING (Bio – technology)

| CO \ PSO | PSO1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|-----------------|-------------|--------------|--------------|--------------|--------------|
| CO1 | S | H | M | H | M |
| CO2 | S | S | H | H | H |
| CO3 | S | H | M | H | M |
| CO4 | S | H | H | M | H |

S – Strong **H** – High **M** – Medium **L** – Low

| | | | | |
|--|--------------------------------|--|-------------------|--------------|
| Programme: B.Sc., | | Title: Bio Technology(I Year), Physics(II year), Botany(II Year), Biochemisrty(II year) | | |
| Course Code: 19UCH2AL/19UCH4AL | | Title: ALLIED CHEMISTRY PRACTICAL – I VOLUMETRIC AND ORGANIC ANALYSIS | | |
| Batch 2019-2020 | Semester I & II/III & IV | Hours / Week 3 | Total Hours 90 | Credits 2 |

Course Objectives

1. To demonstrate the basic laboratory technique of titration.
2. To gain deep knowledge about analysis of organic substances.
3. To identify the functional groups of unknown compounds.

Course Outcomes (CO)

| | | |
|-------|-----|--|
| K1,K2 | CO1 | Remember the basics of volumetric titrations. |
| K2,K3 | CO2 | Studying the use of indicators for various titrations. |
| K2 | CO3 | Understanding about preliminary analysis of organic compounds. |
| K4 | CO4 | Identification of the functional groups. |

Volumetric Analysis

1. Estimation of Sodium hydroxide using standard Sodium Carbonate Solution
2. Estimation of Hydrochloric acid-standard Oxalic acid
3. Estimation of Oxalic acid- Standard sulphuric acid.
4. Estimation of ferrous Sulphate –Standard Mohr salt solution.
5. Estimation of Oxalic acid- Standard ferrous Sulphate solution.
6. Estimation of Potassium permanganate- Standard sodium hydroxide solution

Organic Analysis

1. Detection of elements (N, S, Halogens).
2. To distinguish between Aliphatic and Aromatic.
3. To distinguish between Saturated and unsaturated.
4. Functional group test for Phenol, acids, (mono and di), aromatic primary amine, amide (mono and di), dextrose.
5. Systematic analysis of Organic compounds containing one functional group and characterization by confirmatory tests.

REFERENCE BOOKS

1. V. Venkateswaran, R. Veeraswamy, A.R. Kulandaivelu,(1997) **Basic Principles of Practical Chemistry**, New Delhi, Sultan Chand and Sons.
2. N. S. Gnanapragasam and G. Ramamoorthy, (2006) Organic Chemistry Lab manual, S. Viswanathan Private Limitad, Chennai.

Time - 3 Hours

Max. Marks: 30

Distribution of Total Marks 30

| | |
|------------------|----|
| Record | 5 |
| Volumetric | 12 |
| Organic Analysis | 13 |

Distribution of Volumetric - 12 Marks

| | |
|----------------|----|
| Error up to 2% | 12 |
| 3% | 9 |
| 4% | 5 |
| >4% | 2 |

- ❖ Reduce 1 mark for each arithmetic error
- ❖ For wrong or no calculation, reduce 25% of the marks awarded. (Here, the examiners have to do the calculation and then, have to award marks)

Distribution of Organic Analysis - 13 Marks

| | |
|-------------------------|-----|
| Preliminary Tests | - 3 |
| Aliphatic / Aromatic | - 2 |
| Saturated / Unsaturated | - 2 |
| Special elements | - 3 |
| Functional group | - 3 |

MAPPING (Physics)

| CO \ PSO | PSO1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|-----------------|-------------|--------------|--------------|--------------|--------------|
| CO1 | S | H | M | H | M |
| CO2 | S | S | H | H | H |
| CO3 | S | H | M | H | M |
| CO4 | S | H | H | M | H |

S – Strong **H** – High **M** – Medium **L** – Low

MAPPING (Bio-Chemistry)

| CO \ PSO | PSO1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|-----------------|-------------|--------------|--------------|--------------|--------------|
| CO1 | S | H | M | H | M |
| CO2 | S | M | H | M | H |
| CO3 | S | H | H | H | M |
| CO4 | S | H | H | M | M |

S – Strong **H** – High **M** – Medium **L** – Low

MAPPING (Botany)

| CO \ PSO | PSO1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|-----------------|-------------|--------------|--------------|--------------|--------------|
| CO1 | S | M | M | H | H |
| CO2 | S | S | H | M | H |
| CO3 | H | H | H | H | M |
| CO4 | S | H | H | M | H |

S – Strong **H** – High **M** – Medium **L** – Low

MAPPING (Bio – technology)

| CO \ PSO | PSO1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|-----------------|-------------|--------------|--------------|--------------|--------------|
| CO1 | S | H | M | H | M |
| CO2 | S | S | H | H | H |
| CO3 | S | H | M | H | M |
| CO4 | S | H | H | M | H |

S – Strong **H** – High **M** – Medium **L** – Low