KONGUNADU ARTS AND SCIENCE COLLEGE (Autonomous)

Coimbatore - 641029

B.Sc., CHEMISTRY

Curriculum and Scheme of Examination under CBCS

(Applicable to the Students Admitted during the Academic Year 2014 - 2015 and onwards)

Semester	Part	Subject Code	Title of the Paper	Instruction Hours/ Cycle	Exam Marks			Duration of Exam (Hours)	Credits
					CIA	ESE	Total		
I	I	13TML101	Language I@	6	25	75	100	3	3
	II	14ENG101	English I	6	25	75	100	3	3
	III	14UCH101	Core Chemistry Paper I General Chemistry - 1	6	25	75	100	3	5
			Core Chemistry Practical I	3	-	-	-	-	-
		13UMA1A2/ 13UZO1A1	Allied Mathematics Paper I/ Allied Zoology Paper I	7/5	25/ 20	75/ 55	100/75	3	5/ 4
			Allied Zoology Practical	2	-	-	-	-	-
	IV	12EVS101	Environmental Studies* *	2	-	50	50	3	2
II	I	13TML202	Language II@	6	25	75	100	3	3
	II	14ENG202	English II	6	25	75	100	3	3
	III	14UCH202	Core Chemistry Paper II General Chemistry - 2	6	25	75	100	3	5
		14UCH2CL	Core Chemistry Practical I	3	40	60	100	3	2
		13UMA2A2/ 12UZO2A2	Allied Mathematics Paper II/Allied Zoology Paper II	7/5	25/ 20	75/ 55	100/75	3	5/ 4
		12UZO2AL	Allied Zoology Practical	2	20	30	50	3	2
	IV	14VED201	Value Education-Moral & Ethics* *	2	-	50	50	3	2
III	I	13TML303	Language III @	6	25	75	100	3	3
	II	14ENG303	English III	6	25	75	100	3	3

	III	14UCH303	Core Chemistry Paper III General Chemistry - 3	4	25	75	100	3	4
			Core Chemistry Practical II	3	-	-	-	-	-
		12UPH3A1	Allied Physics Paper I	4	20	55	75	3	4
			Allied Physics Practical I	3	-	-	-	-	-
	IV	14UGA3S1	Skill Based Subject 1 General Awareness (on line)	2	25	75	100	3	3
		13TBT301/13TAT301/ 12UHR3N1	Basic Tamil*/ Advanced Tamil**/ Non Major elective –I **(Human Rights)	2	75		75	3	2
IV	I	13TML404	Language IV @	6	25	75	100	3	3
	II	14ENG404	English IV	6	25	75	100	3	3
	III	14UCH404	Core Chemistry paper IV General Chemistry - 4	4	25	75	100	3	4
		14UCH4CM	Core Chemistry Practical II	3	40	60	100	6	3
		12UPH4A2	Allied Physics Paper II	5	20	55	75	3	4
		12UPH4AL	Allied Physics Practical I	2	20	30	50	3	2
	IV	14UCH4S2	Skill Based Subject 2 Water chemistry	2	25	75	100	3	3
	IV	13TBT402/13TAT402/ 12UWR4N2	Basic Tamil*/ Advanced Tamil**/ Non Major elective –II**(Women's Rights)	2		75	75	3	2
V	III	14UCH505	Core Chemistry Paper –V Spectroscopy and chromatographic techniques	3	25	75	100	3	3
		14UCH506	Core Chemistry Paper –VI Inorganic Chemistry – 1	4	25	75	100	3	4
		14UCH507	Core Chemistry Paper –VII Organic Chemistry - 1	4	25	75	100	3	4
		14UCH508	Core Chemistry Paper –VIII Physical Chemistry - 1	4	25	75	100	3	4

		14UCH5E1	Major Elective 1	3	25	75	100	3	5
		14UCH6CN	Core Chemistry Practical -III	3	-	-	-	-	-
		14UCH6CO	Core Chemistry Practical–IV	4	-	-	-	-	-
		14UCH6CP	Core Chemistry Practical -V	3	-	-	-	-	-
	IV	14UCH5S3	Skill Based Subject-3 Chemical Industry	2	25	75	100	3	3
VI	III	14UCH609	Core Chemistry Paper-IX Inorganic Chemistry - 2	4	25	75	100	3	4
		14UCH610	Core Chemistry Paper-X Organic Chemistry - 2	4	25	75	100	3	4
		14UCH611	Core Chemistry Paper-XI Physical Chemistry - 2	4	25	75	100	3	4
		14UCH6E2	Major Elective – 2	3	25	75	100	3	5
		14UCH6E3	Major Elective - 3	3	25	75	100	3	5
		14UCH6CN	Core Chemistry Practical-III	3	40	60	100	3	3
		14UCH6CO	Core Chemistry Practical–IV	3	40	60	100	3	3
		14UCH6CP	Core Chemistry Practical -V	4	40	60	100	3	4
	IV	14UCH6S4	Skill Based Subject- 4 Food chemistry	2	25	75	100	3	3
	V	14NCC/NSS/YRC/ PYE101	Extension Activities *	-	50	-	50	-	1

@ Hindi/Malayalam/French/Sanskrit – 12HIN/13MLN/12FRN/12SAN101 – 404.

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

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

MAJOR ELECTIVE PAPERS

(Three papers are to be chosen from the following five papers.)

1. Polymer Chemistry
2. Nano and Green Chemistry
3. Dye Chemistry
4. Pharmaceutical Chemistry
5. Agricultural Chemistry

TALLY TABLE

PART	SUBJECT	TOTAL MARKS	TOTAL CREDIT POINTS
Part I	Lang-Tamil/Hindi/ Malayalam/ French/Sanskrit	400	12
Part II	Lang-English	400	12
Part III	Core-Theory/Practical/Project	1600	60
	Allied……	400	20(10+10)
	Elective……	300	15(5+5+5)
Part IV	Basic Tamil/ Advanced Tamil/		
	Non Major elective…….	150	4
	Skill Based Subject…….	400	12
	Environmental Studies……..	50	2
	Value Education…...	50	2
Part V	Extension Activities (NSS/NCC/Sports/YRC)	50	1
Grand Total		**3800**	**140**

Note :

CBCS - Choice Based Credit System

CIA - Continuous Internal Assessment

ESE - End of Semester Examinations

JOC, COP and Diploma Courses are considered as extra credit courses.

JOC - Textile chemistry

MARK DISTRIBUTION

I. THEORY PAPERS- INTERNAL (25 Marks)

CIA Examination	15
Assignment	5
Attendance	5
Total	**25**

II. PRACTICAL PAPERS - INTERNAL (40 Marks)

CIA-Examination	25
Observation	10
Attendance	05
Total	**40**

Distribution of questions and question paper pattern for End Semester Examination and CIA examinations (theory papers only) – 75 Marks

SECTION	No. of Questions per unit	Marks per Question	Total No. of Questions	Total Marks
A (Multiple Choice)	2	1	10	10
B (Paragraph answer) either or type	2	5	10	25
C (Essay type) either or type	2	8	10	40
Total marks				**75**

Subject code : 14UCH101

SEMESTER-I

CORE CHEMISTRY PAPER- I

GENERAL CHEMISTRY - 1

Total teaching hours: 90 **Total credits : 5**

Units	Learning objectives
I	To know the concept of qualitative inorganic analysis
II	To learn basic nomenclature of inorganic compounds
III	To have an idea about hydrocarbons and electron displacement reactions
IV	To understand higher details in atomic structure
V	To know about the wave mechanical approach of an atom

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. Interferring 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 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. (18 hours)

UNIT-III

Chemistry of Alkanes and Cycloalkanes

1. **Electron displacement effects :** Inductive effect, mesomeric effect, electromeric effect and hyperconjugative effect.

2. Chemistry of Alkanes : Chemistry of alkanes: occurrence, General methods of preparations – hydrogenation of alkenes and alkynes, decarboxylation of carboxylic acids, reduction of alkyl halides, reduction of alcohols, aldehydes, ketones and carboxylic acids. Action of sodium on alkyl halides (Wurtz's reaction), Hydrolysis of Grignard reagents, Kolbe's method. Physical properties and chemical properties – substitution reactions. Conformations of ethane and n-butane.

3. Chemistry of cyclo-alkanes

Preparation – dihalogen compounds, calcium or barium salts of dicarboxylic acids, esters of dicarboxylic acids (Dieck reaction), aromatic compounds. Physical properties and chemical properties. Stability of cyclo-alkanes – Bayer – Strain theory. Conformation of cyclohexanes.

(18 hours)

UNIT-IV

Structure of atom – Classical Mechanics

Discovery of electron – Measurement of e/m for Electrons. Determination of charge of an electron. – Positive rays. Protons – Nucleons – subatomic particles – Alpha particles. Rutherford's Atomic model – Mosleys determination of Atomic Number – Mass Number – Quantum Theory and Bohr Atom. (18 hours)

UNIT-V

Structure of atom – Wave mechanical approach

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.** (18 hours)

self study portion

TEXT BOOKS

1. G. Svehla, **Vogel's Text book of Macro and Semimicro Qualitative Analysis**, Longman Inc., 7th Edition, Newyork, Reprint 1997.
2. R. D. Madan, **Modern Inorganic Chemistry**, S. Chand & Co., New Delhi, 2004.
3. B. R. Puri, L. R. Sharma, K. K. Kalia, **Principles of Inorganic Chemistry**, Milestone Publishers and Distributors, New Delhi, 2008.
4. Arun Bahl , B.S.Bahl, **Advanced Organic Chemistry,** S. Chand & Co., New Delhi, 2010.
5. Arun Bahl and B.S.Bahl, G.D.Tuli, **Essentials of Physical Chemistry**, S. Chand & Co., New Delhi, 2009.

REFERENCE BOOKS

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

Part IV – I Semester 12EVS101

ENVIRONMENTAL STUDIES

(2012-13 onwards)

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 (6 hours)

1.1 Definition : scope and importance

1.2 **Need for public awareness***

1.3 Natural resources

1.3.1 Types of resources

Forest Resources – Water Resources – Mineral Resources – Food Resources – Energy Resources – Land Resources.

UNIT II ECOSYSTEMS (6 hours)

2.1 Concept of an ecosystem

2.2 Structure and functions of an ecosystem

2.3 Producers, consumers and decomposers

2.4 Energy flow in the ecosystem

2.5 Ecological succession

2.6 Food chains, food web and ecological pyramids

2.7 Structure and function of the following ecosystem*

Forest Ecosystem – Grassland Ecosystem – Desert Ecosystem – Aquatic Ecosystem.

UNIT III BIODIVERSITY AND ITS CONSERVATION (6 hours)

3.1 Introduction – Definition – Genetic – Species and ecosystem diversity

3.2 Biogeographical classification of India

3.3 Value of biodiversity*

3.4 Biodiversity at global, national and local levels

3.5 India as a mega – diversity Nation

3.6 Hot spot of biodiversity

3.7 Threats to biodiversity

3.8 Endangered and endemic species of India

3.9 Conservation of Biodiversity

insitu Conservation of Biodiversity – *exsitu* Conservation of Biodiversity

UNIT IV ENVIRONMENTAL POLLUTION (6 hours)

4.1 Definition

4.2 Causes, effects and control measures of: Air Pollution – Water Pollution – Soil Pollution – Marine Pollution – Noise Pollution – Thermal Pollution – Nuclear Pollution.

4.3 Solid Waste Managements: causes, effects, control measures of urban and industrial wastes.

4.4 Role of individual in prevention of pollution*.

4.5 Pollution case studies – domestic waste water, effluent from paper mill and dyeing, cement pollution.

4.6 Disaster Management – Flood, Drought, Earthquake, Tsunami, Cyclone and Landslide.

UNIT V SOCIAL ISSUES AND THE ENVIRONMENT (6 hours)

5.1 Sustainable Development

5.2 Urban problems related to energy

5.3 Water Conservation : Rain Water Harvesting and Watershed Management

5.4 Resettlement and rehabilitation of people, its problems and concerns, case studies – Narmatha Valley Project.

5.5 Environmental ethics, issues and possible solutions.

5.6 Climatic change, global warming, ozone layer depletion, acid rain, nuclear accidents and holocaust, case studies – Hiroshima and Nagasaki, Chernobyl.

5.7 Consumerism and waste products

5.8 Environmental Protection Act

5.9 Air Pollution Act (Prevention and Control)

5.10 Water Pollution Act (Prevention and Control)

5.11 Wild Life Protection Act

5.12 Forest Conservation Act

5.13 Issues involved in enforcement of environmental legislation

5.14 Public awareness*

5.15 Human population and the environment

5.15.1 Population Growth and Distribution

5.15.2 Population Explosion – Family Welfare Programme*

5.15.3 Environment and Human Health

5.15.4 Human Rights*

5.15.5 Value Education*

5.15.6 HIV / AIDS*

5.15.7 Women and Child Welfare

5.15.8 Role of Information Technology in Environment and Human Health*.

*** 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.

References

1. Purohit Shammi Agarwal, A text Book of Environmental Sciences, Publisher Mrs. Saraswati Prohit, Student Edition, 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.

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.

Subject code: 14UCH202

SEMESTER-II

CORE CHEMISTRY PAPER - II

GENERAL CHEMISTRY - 2

Total teaching hours: 90 **Total credits: 5**

Units	Learning objectives
I	To know the concept of quantitative inorganic analysis
II	To learn about periodic table and periodic properties
III	To learn about electrophilic substitution reaction of benzene and aromaticity
IV	To know about basic energetics
V	To study basic thermochemistry

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, 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. (18 hours)

UNIT-II

Periodic table and atomic properties

1. * **Long form periodic table – cause of periodicity – division of elements into s,p,d and f block elements.**

2. Atomic properties: Sizes of atoms and ions - covalent radius, Vanderwaals radius and ionic radius. Ionization energy – factors determining ionization energy, variation of ionization energy in the periodic table. Electron affinity – variation of electron affinity in the periodic table. Electronegativity – pauling's approach, Allred and Rochow's approach, Mullikens approach, factors influencing electronegativity, applications of electronegativity. (18 hours)

UNIT-III

Aromaticity and Electrophilic substitution reaction

1. Aromaticity: The concept of Aromaticity, Aromatic, anti aromatic, and non aromatic compounds, Huckel's rule, Applications of Huckel's rule – Annulenes

2. Electrophilic substitution on benzene:

Orientation effect of substituents on further electrophilic aromatic substitution – effect of activating group, effect of deactivating group, steric factors in electrophilic aromatic substitution, introduction of third substituent into the benzene ring, orientation – Kornor's absolute method, Reverse of Griess's method and indirect method. (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 Cp and Cv – 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

TEXT BOOKS

1. Puri B.R, Sharma L.R, Kalia K.C., **Principles of Inorganic Chemistry**, MILESTONE publishers and Distributors, New Delhi, 2008.
2. Sathya praksash, G.D. Tuli, S. K. Basu, R.D. Madhan, **Advanced Inorganic Chemistry,** Volume 1, S. Chand & Company, New Delhi, 2012.
3. M.K. Jain, S.C. Sharma, **Modern Organic Chemistry**, Vishal Publishing Co., Delhi 2011.
4. B.S. Bahl, and Arun Bahl **Advanced Organic Chemistry**, S.Chand and Co, New Delhi, 2012.
5. B.S. Bahl and G. D. Tuli, and Arun Bahl, **Essentials of Physical Chemistry,** S. Chand and Co., 2008.

REFERENCE BOOKS

1. R. D. Madan, **Modern Inorganic Chemistry**, S.Chand and Co., 2004.
2. R. Gopalan, **Inorganic Chemistry For Undergraduate**, Universities Press (India) Private Limited, Hyderabad, 2009.
3. Puri B. R. Sharma L. R., M. S. Pathania, **Principles of Physical Chemistry,** Shobanlal Nagin Chand & Co., New Delhi, 1993.

SEMESTER – II 14VED201

PART IV VALUE EDUCATION – MORAL AND ETHICS

(2014 – 2015 Batch Onwards)

Total Credits: 2 **Total hours: 30**

UNIT I

Introduction to Moral and Ethics; Aim of Education (6 Hours)

UNIT II

Ethics and Culture (6 Hours)

UNIT III

Early Life of Swami Vivekananda (6 Hours)

UNIT IV

The Parliament of Religions (6 Hours)

UNIT V

Teachings of Swami Vivekananda (6 Hours)

Text Book:

Value Based Education - Kongunadu Arts and Science College, Coimbatore, First Edition, 2014.

References :

1. **Moral and Ethics** - Published by Dr.M.Aruchami, Secretary and Director, Kongunadu Arts and Science College, Coimbatore, First Edition, June 2007.

2. **"Vivekananda A Biography"** - Swami Nikilananda, 29th Reprint, January 2013, Published by Swami Bodhasarananda, Adhyaksha, Advaita Ashrama, Mayavati, Champawat, Uttarakhand, Himalayas.

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.

Subject code: 14UCH2CL

SEMESTER I & 11

CORECHEMISTRY PRACTICAL - I

Total teaching hours: 90 **Total credits: 2**

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. Tetra-ammineCopper (II) Sulphate
2. PotassiumtrioxalatoChromate (III)
3. Prussian blue
4. HexammineCobalt (II) Chloride
5. Hexathiourealead(II) nitrate
6. Tristhioureacopper(I) sulphate

BOOKS FOR REFERENCE

1. Venkateswaran. V, Veeraswamy. R, Kulandaivelu . A.R, **Basic Principles of Practical Chemistry,** 2nd Edition, New Delhi, Sultan Chand and Sons, 1997.
2. G. Svehla, **Vogel's Qualitative Inorganic Analysis,** Orient Longman Ltd, Hyderabad, 1987.

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.

Subject code: 14UCH303

SEMESTER - III

CORE CHEMISTRY PAPER - III

GENERAL CHEMISTRY - 3

Total teaching hours: 60 **Total credits: 4**

Units	Learning objectives
I	To introduce basic concepts in metallurgy
II	To understand the chemistry of dicarboxylic acids
III	To learn about some name reactions involving carbonyl compounds
IV	To know about second law of thermodynamics, state functions S, A and G
V	To study about materials with minimum S and chemical equilibrium

UNIT-I

Principles and Processes of Metallurgy

***Minerals – ores - occurrence of metals-classification of ores**-various steps involved in the metallurgical processes- concentration of ores by froth floatation-gravity separation - magnetic separation processes- calcination – roasting - smelting - alumino thermic process - purification of metals by electro refining - zone refining-van Arkel process - furnaces- different types.

(12 hours)

UNIT-II

Dicarboxylic acids

Preparation, properties and uses of Oxalic, Malonic, Succinic, Glutaric and Adipic acids. Preparation, 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

Some reactions of aldehydes and ketones

Nucleophilic addition of Grignard reagents, aldol condensation, Perkin, Knoevenagel, Claisen, Reformatsky reaction, reactions with $LiAlH_4$ and $NaBH_4$, WolfKishner, MPV reductions and Cannizzaro 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 - Gibb'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 and concept. Determination of absolute entropy of solids, liquids and gases. Standard absolute entropies (S^o). Entropy change in chemical reactions. Unattainability of absolute zero. Derivation of Boltzmann entropy equation. Residual entropy. (12 hours)

self study portion

TEXT BOOKS

1. R. D. Madan, **Modern Inorganic Chemistry**, S. Chand & Co., New Delhi, 2011, Reprint 2013.
2. B. R. Puri, L. R. Sharma, K. K. Kalia, **Principles of Inorganic Chemistry**, Milestone Publishers and Distributors, New Delhi, 2008.
3. Arun Bahl, B. S. Bahl, **Advanced Organic Chemistry,** S. Chand & Co., New Delhi, 2010.
4. Arun Bahl and B. S. Bahl, G. D. Tuli, **Essentials of Physical Chemistry**, S. Chand & Co., New Delhi, 2009.
5. B. R. Puri, L. R. Sharma, M. S. Pathania, **Principles of Physical Chemistry,** S. Chand & Co., New Delhi, 2009.

REFERENCE BOOKS

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

Subject code: 12UHR3N1

SEMESTER-III

Non –Major Elective – I "Human Rights"

Total teaching hours: 30 **Total credits: 2**

UNIT – I

Concept of Human values, Value Education towards Personal Development.

Aim of education and value education; Evolution of value – oriented education; concept of human values; types of values; Components of value education.

Personal Development:

Self – analysis and introspection; sensitization towards gender equality, physically- challenged, intellectually-challenged. Respect to – age, experience, maturity, family members, neighbors, co-workers.

Character formation towards positive personality:

Truthfulness, Constructively, Sacrifice, Sincerity, Self-Control, Altruism, Tolerance, Scientific vision.

UNIT – II

Value Education towards National and Global Development

National and International Values:

Constitutional or national values – Democracy, socialism, secularism, equality, justice, liberty, freedom and fraternity.

Social Values – Pity and probity, self-control, universal brotherhood.

Professional Values – Knowledge thirst, sincerity in profession, regularity, punctuality and faith.

Religious Values – Tolerance , Wisdom, Character.

Aesthetic Values – Love and appreciation of literature and fine arts and respect for the same.

National Integration and international understanding.

UNIT III

Impact of Global Development on Ethics and Values

Conflict of cross – cultural influences, mass media, cross-border education, materialistic values, professional challenges and compromise.

Modern challenges of adolescent emotion and behavior; sex and spirituality: comparison and competition; positive and negative thoughts.

Adolescent emotions, arrogance, anger, sexual instability, selfishness, defiance.

UNIT – IV

Therapeutic Measures

Control of the mind through

a. Simplified physical exercise

a. Meditation – objectives, types, effect on body, mind and soul
b. Yoga – objectives, types, Asanas
c. D. Activities:

(i) Moralisation of Desires

(ii) Neutralisation of Anger

(iii) Eradication of Worries

(iv) Benefits of Blessings

UNIT – V : Human Rights

1. Concept of Human Rights – Indian and International Perspectives

a. Indian and International Perspectives

b. Definitions under Indian and International documents

2. Broad classification of Human Rights and Relevant Constitutional Provisions.

a. Right to life, Liberty and Dignity
b. Right to Equality
c. Right against exploitation
d. Cultural and educational Rights
e. Economic Rights
f. Political Rights
g. Social Rights
h. Right to information

3. Human Rights of Women and Children

- Social Practice and Constitutional Safeguards

(i) Female Foeticide and Infanticide

(ii) Physical assault and harassment

(iii) Domestic violence

(iv) Conditions of working Women

4. Institution for Implimentation

i. Human Rights Commission

j. Judiciary

5.Violation and Redressal

k. Violation by State

l. Violation by Individuals

m. Nuclear Weapons and terrorism

n. Safeguard

Part IV – III Semester 14UGA3S1

Skill Based Subject 1 – 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 – Bakthi 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.

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) – Dril – Weapon Training – Map Reading – Civil Defence.

14. National Service Scheme (NSS)

History of NSS – History of Motto, Symbol, Badge – Aims and Objectives – Duties and Total Hours – Organisational and Administrational 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.

Subject code : 14UCH404

SEMESTER - IV

CORE CHEMISTRY PAPER - IV

GENERAL CHEMISTRY – 4

Total teaching hours: 60 **Total credits : 4**

Units	Learning objectives
I	To study IA group alkali metals
II	To know more about naming reactions and mechanism of phenols
III	To learn about physical and chemical properties of amines and diazomethanes
IV	To introduce phase equilibrium- one and two component systems
V	To understand about the Physical chemistry laws.

UNIT-I

Group IA elements - Alkali metals

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

(12 hours)

UNIT-II

Phenols

Monohydric Phenols - preparation and properties. Reaction of monohydric phenols - Esterification, Nitration, Sulphonation, Halogenation, coupling with diazonium salts, Kolbe, Reimer-Tiemann, Schotten-Baumann, Hoesch-Houben reaction and Gattermann reactions. Preparation and properties of Alpha and Beta- naphthols.

(12 hours)

UNIT-III

Amines and Diazo compounds

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

Preparation, structure and their synthetic applications of Diazomethane and Diazoacetic ester.

(12 hours)

UNIT-IV

Phase rule and Phase equilibria

Phase rule-statement- Definition of terms phase, component, and degrees of freedom.Derivation of Gibb's Phase rule. Application to One component systems- Phase diagrams-Polymorphism-Experimental determination of transition point. Water, Carbon dioxide and Sulphur systems.

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-Types of solutions-Ways of expressing concentration of solutions-Mass percentage, volume percentage, normality, molarity, molality, mole fraction. 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. Measurement of freezing point depression –Rast's Camphor method.

Osmosis - silica garden and the egg experiment. Semipermeable membrane- Osmotic pressure-Determination of osmotic pressure by modern osmometer – isotonic solutions- Reverse osmosis.

(12 hours)

self study portion

TEXT BOOKS

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

REFERENCE BOOKS

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

Subject code: 14UCH4S2

SEMESTER – IV

SKILL BASED SUBJECT - 2

Total teaching hours: 60 **WATER CHEMISTRY** **Total credits: 3**

Units	Learning objectives
I	To know about the sources and characteristics of water
II	To gain knowledge about the type of pollutants in water
III	To learn about the analysis of the pollutants in water
IV	To learn the methods of purification of water
V	To get knowledge about the water management

UNIT-I

Sources of water

Introduction - uses of water - water for industry - Sources of water - 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 - Environmental phosphorus chemistry. (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. (6 hours)

Unit- III

Analysis of a water pollutants

Measurement of water quality by chemical and physical examination of water - Chemical substances affecting potability - electrical conductivity - suspended solids - dissolved solids - alkalinity - measurement of toxic chemical substances - general analytical methods of determination of metals - 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 - Sterilisation and disinfection of water - 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

TEXT BOOK

1. B.K Sharma, **Water pollution,** Goel publishing House, Meerut, 2003.

REFFRENCES

1. Jain and Jain, **Engineering Chemistry**, Dhanpat Rai Publishing Co., 1998.

2. N. Manivasakam (Water Analyst), **Chemical and Microbiological Analysis of Mineral Water and Packaged Drinking Water,** Principal Public Health Laboratory, Coimbatore, 2001.

Subject code : 12UWR4N2

SEMESTER - IV

Non – Major Elective – II " Women's Rights"

Total teaching hours: 30 **Total credits : 2**

UNIT I

Laws, Legal Systems and Change

Definition – Constitutional Law, CEDAW and International Human Rights - Laws and Norms – Laws and Social Context – Constitutional and Legal Framework.

UNIT II

Politics of land and gender in India

Introduction – Faces and Poverty – Land as Productive Resources – Locating Identities - Women's Claims to Land – Right to Property – Case Studies.

UNIT III

Women's Rights : Access to Justice

Introduction – Criminal Law – Crime Against Women – Domestic Violence – Dowry Related Harassment and Dowry Deaths – Molestation – Sexual Abuse and Rape – Loopholes in Practice – Law Enforcement Agency.

UNIT - IV

Women's Rights :

Violence Against Women – Domestic Violence – The Protection of Women from Domestic Violence Act, 1856 – The Dowry prohibition Act, 1961.

UNIT – V

Special Women Welfare Laws:

Sexual Harassment at Work places – Rape and Indecent Representation – The Indecent Representation (prohibition) Act, 1986 – Immoral Trafficking – The Immoral Trafic (Prevention) Act, 1956 – Acts Enacted for Women Development and Empowerment – Role of Rape Crisis Centers.

Subject code: 14UCH4CM

SEMESTER III & 1V

CORECHEMISTRY PRACTICAL - II

Total teaching hours: 90 **Total credits: 4**

I. a. Titrimetric Quantitative Analysis

1. Simple acid base double titration
2. Preparation of standard solution by weighing a salt using chemical balance.
3. Making up of a given solution and doing a simple double titration.

b. 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.

c. Permanganametry:

1.Estimation of Oxlaic acid by $KMnO_4$ using a standard Oxalic acid solution

2.Estimation 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

d. Dichrometry:

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

e. Iodometry:

1. Estimation of $KMnO_4$ by Thio using a standard Potassium dichromate Solution

2.Estimation of Copper (II) Sulphate by $K_2Cr_2O_7$ solution

3. Estimation of Arsenious Oxide using iodide solution and Standard Arsenious oxide solution

II. Organic analysis

Analysis of organic compounds

1. Preliminary tests
2. Detection of elements present
3. Aromatic or Aliphatic
4. Saturated or Unsaturated
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, Veeraswmay. R, Kulandaivelu. A.R., **Basic Principles of Practical Chemistry**, 2nd Edition, NewDelhi, Sultan Chand and Sons, 1997.
2. Mendham. J, Denney. R.C, Bames. J.D, and Thomas, M. **Vogel's Text book of Quantitative Analysis**, 6th Edition, Pearson Education, 1989.
3. Gopalan. R, Subramaniam. P.S, and Rengarajan. K, **Elements of Analytical Chemistry,** Sultan Chand and Sons, 2004**.**

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	5
Functional group	6
Derivative	3

- **Substance to be given for organic analysis:** Cinnamic acid, Benzoic acid, Salicylic acid, Succinic acid, Aniline, Benzamide, Urea, Benzaldehyde, Salicylaldehyde, Acetophenone, Phenol, Cresols, Resorcinol, Glucose, Toludine, Nitrobenzene.

Subject code : 14UCH505

SEMESTER - V

CORE CHEMISTRY PAPER - V

SPECTROSCOPY AND CHROMATOGRAPHIC TECHNIQUES

Total teaching hours: 45 **Total credits : 3**

Units	Learning objectives
I	To know electromagnetic spectrum and ultra – violet visible spectroscopy
II	To study Infrared spectroscopy
III	To learn Nuclear Magnetic Resonance (NMR) spectroscopy
IV	To study the basics of Mass spectrometry and to interpret and solve problems using various spectra
V	To have an idea about Chromatographic techniques

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, 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.

(9 hours)

UNIT II

Infrared spectroscopy

Principles of Infrared spectroscopy, molecular vibrations, vibrational frequency, number of fundamental vibrations, selection rules, factors influencing vibrational frequency – coupled vibrations and Fermi resonance, electronic effects, hydrogen bonding and bond angles. Scanning of infrared spectrum (instrumentation), sampling techniques, finger print region. (9 hours)

UNIT – III

Nuclear Magnetic Resonance (NMR) spectroscopy

Introduction , relaxation process – spin –spin relaxation, spin – lattice relaxation and quadrupole relaxation. Number of signals, instrumentation, positions of signals (chemical shift), shielding and deshielding effects, factors influencing chemical shift – inductive effect, vander Waal's deshielding, Anisotropic effects and hydrogen bonding. Peak area and proton coupling , splitting of the signals, spin – spin coupling, coupling constant. (9 hours)

UNIT – IV

Mass spectrometry and application of spectroscopic methods

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

UV, IR, NMR, techniques in the identification of simple organic molecules. (Ethanol and dimethyl ether, acetaldehyde and acetone, ethylene and acetylene, cis-2-butene and trans-2-butene). (9 hours)

UNIT – V

Chromatography

Introduction, definition, types, thin layer chromatography – experimental techniques - coating materials - preparation of thin layer in plates – activation of adsorbents – purification of silica gel – sample application – development tank – solvent systems – plate development – detection of components, evaluation of chromatography. Column chromatography – principle , experimental techniques – apparatus – adsorbents – preparation of adsorption columns – solvents used in successive elution – gradient elution. (9 hours)

self study portion

TEXT BOOKS

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

REFERENCE BOOKS

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

Subject code: 14UCH506

SEMESTER - V

CORE CHEMISTRY PAPER - VI

INORGANIC CHEMISTRY - 1

Total teaching hours: 60 **Total credits: 4**

Units	Learning objectives
I	To study about coordination compounds
II	To know about radioactivity
III	To have an idea about nuclear reactions
IV	To introduce acid base concepts
V	To gain deep knowledge about solvents

UNIT - I

Co-ordination Compounds

Co-ordination Compounds – Nomenclature - conductivity and precipitation studies - 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 – C^{14} dating – dating of Universe.

(12 hours)

UNIT - III

Nuclear Chemistry - II

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

Solvents

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, anhydrous sulfuric acid and hydrogen fluoride) - aprotic solvents (SO_2 and liquid N_2O_4). Molten salts as solvents. (12 hours)

****self study portion***

TEXT BOOKS

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

REFERENCE BOOKS

1. Karen C.Timberlake , **Basic Chemistry**, Los Angeles Valley College, Pearson- Benjamin Cummings, San Francisco, First Edition, 2005.
2. G. S. Manku, **Theoretical Principles of Inorganic Chemistry**, Mc - Graw Hill Education, 2004.
3. M. G. Arora, M. Singh, **Nuclear Chemistry,** Anmol publications Pvt. Ltd., New Delhi, 1994.
4. Sathya Praksash, G.D. Tuli, S. K. Basu, R.D. Madhan, **Advanced Inorganic Chemistry,** Vol. 1, S. Chand & Co., New Delhi, 2012.
5. H. J. Arnikar, **Essentials of Nuclear Chemistry**, New Age International, 1995.

Subject code : 14UCH507

SEMESTER - V

CORE CHEMISTRY PAPER - VII

ORGANIC CHMISTRY - 1

Total teaching hours: 60 **Total credits: 4**

Units	Learning objectives
I	To study asymmetry and optical activity of organic molecules
II	To study some novel name reactions
III	To understand the mechanisms of important organic rearrangements
IV	To learn the chemistry of amino acids, proteins and peptides
V	To study reactions and properties of heterocyclic compounds

UNIT-I

Stereochemistry

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

UNIT-II

Name reactions

Reactions and applications of – Clemmensen reduction, Fischer-Indole synthesis, Friedlander synthesis, Gattermann-Koch aldehyde synthesis, Kolbe – Schmidt reaction, Vilsmeyer reaction.

(12 hours)

UNIT-III

Molecular Rearrangements with mechanism

Reaction, mechanism, evidences and applications of molecular rearrangement reactions - Pinacol-Pinacolone, Beckmann, Hoffmann, Curtius, Benzilic acid and Claisen Rearrangements.

(12 hours)

UNIT-IV

Amino acids , Proteins and peptides.

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. N-terminal and C-terminal amino acid residues.

2. Proteins, classification – according to chemical composition. Structure of proteins – primary – secondary and tertiary structure. General properties of proteins. Denature of proteins. Colour test for proteins.

3. Nomenclature of peptides – determination of structure of peptides – end group analysis – synthesis of peptides.

(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

TEXT BOOKS

1. Arun Bahl and B.S.Bahl, **Advanced Organic Chemistry,** S. Chand and Co., New Delhi, 2012.

2. Gurdeep. R. Chatwal, **Reaction Mechanism and Reagents in Organic Chemistry,** Himalaya Publishing House Delhi, 2013.

3. M.K. Jain, S.C. Sharma, **Modern Organic Chemistry**, Vishal Publishing Co., Delhi, 2011.

REFERENCE BOOKS

1**.** M.G Arora, **Stereochemistry in Organic Compounds,** Anmol Publications Private Ltd New Delhi, 2008.

2. Jagdamba Singh and Yadav, **Organic Synthesis,** Vol. I and II. Pragathi and Prakasam Publishers, 1st Edition, 2005.

3. I.L.Finar, **Organic Chemistry,**Vol.I and II, Addison-Wesley Longman, 2009.

Subject code : 14UCH508

SEMESTER - V

CORE CHEMISTRY PAPER - VIII

PHYSICAL CHEMISTRY - 1

Total teaching hours: 60 **Total credits : 4**

Units	Learning objectives
I	To understand the fundamentals of electrochemistry
II	To know the importance of electro chemical cells
III	To have a knowledge about electrodes and their types
IV	To gain significant information about fuel cells
V	To have an idea about polarography and surface chemistry

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. 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 $\lambda\alpha$ for strong electrolyte (ii) Determination of dissociation constant of a weak organic acid (iii) Conductometric titrations – acid-base titration. (12 hours)

UNIT - II

Electro Chemical Cells

Galvanic cell – Reversible and irreversible cells - Electrode potentials - The standard hydrogen electrode-kinds of electrode and their potentials - Nernst equations - Computation and measurement of cell emf and Weston - Cadmium cells - Single electrode potentials. Determination and significance of electrode potentials - Electrochemical series and its applications. Thermodynamic quantities of cell reactions.

pH scale – Calculation of pH of strong acid solution and weak acid solution. (12 hours)

UNIT - III

Electrodes and their types

Reference electrodes – Electrodes for measurement of pH – Hydrogen, quinhydrone, and glass electrodes. Buffer solutions - Buffer action, determination of pH values of Buffer mixture and Henderson's equations. Concentration cells with and without transport - Liquid junction potential - Applications of emf measurements - Redox Potentials - redox indicators - diphenyl amine - Potentiometric titrations – acid-base and redox titrations.

(12 hours)

UNIT – IV

Fuel Cells and Corrosion

Fuel cells - Definition and importance, Hydrogen-Oxygen fuel cell, hydrocarbon - Oxygen cell. Storage cells, Lead storage cells and Nickel- Cadmium cells. Decomposition Voltage, Over voltage, Deposition or Discharge Potential cells.

***Corrosion –Definition, types, electrochemical nature, rusting of iron**, prevention - cathodic protection and galvanizing. (12 hours)

UNIT - V

Polarography and Adsorption

Polarography-instrumentation-Advantages of dropping mercury electrode-Limiting current, factors affecting limiting current-Half wave potential- Application of polarography.

Sorption – Absorption, Adsorption-Types of adsorption, adsorption of gases by solids. Adsorption isotherms –Freundlich, Langmuir. Adsorption of solutes from solutions. Application of adsorption.

(12 hours)

****self study portion***

TEXT BOOKS

1. P. L. Soni. O. P. Dharmarha and U. N. Dash, **Textbook of physical chemistry**, S. Chand & Co., New Delhi, 2001.
2. B. R. Puri, L. R. Sharma, M. S. Pathania, **Principles of Physical Chemistry**, S. Chand & Co., New Delhi, 2009.
3. Arun Bahl, B. S. Bahl and G. D. Tuli, **Essentials of Physical Chemistry**, S. Chand & Co., New Delhi, 2009.
4. P. C. Jain and Monika Jain, **Engineering Chemistry**, Dhanpat Rai Publishing Co., New Delhi, 2006.

REFERENCE BOOKS

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

Subject code : 14UCH5S3

SEMESTER - V

SKILL BASED SUBJECT - 3

INDUSTRIAL CHEMISTRY

Total teaching hours: 30 **Total credits : 3**

Units	Learning objectives
I	To gain knowledge about manufacture of sugars
II	To have a thorough idea about Fermentation
III	To get the knowledge about Glass
IV	To have knowledge about Cement and Ceramics
V	To have a thorough idea about Paints and Pigments

UNIT-I

Sugar Industry

Introduction **-** manufacture of cane sugar **-** Extraction of juice - Purification of juice - Defection - sulphitation and carbonation. Concentration or evaporation – Crystallization - separation of crystals - Drying - Refining - Grades. Recovery of sugar from molasses. Manufacture of sucrose from Beetroot. (6 hours)

UNIT –II

Fermentation

Introduction - historical - conditions favourable for fermentation. Characteristics of enzymes - short account of some fermentation processes. Alcohol beverages - manufacture of beer, wines, vinegar and power alcohol. Ethyl alcohol from molasses. (6 hours)

UNIT-III

Glass

Introduction - Physical and chemical properties of glass - Raw materials - Methods of manufacture. Formation of the batch material – melting – shaping - annealing and finishing.

Types of Glasses - soda glass - flint glass - pyrex glass - jena glass and safety glass.

(6 hours)

UNIT – IV

Cement and Ceramics

Cement: ***Manufacture of cement - Settling of cement (Portland cement)**

Ceramics: Manufacturing process - Application of colours to the pottery - Earthenware's and Stonewares (6 hours)

UNIT V

Pigments and Paints

Pigments: Introduction -Requirements of a pigment - Typical inorganic pigments - Applications.

Paints: Classification of paints – Distempers - Constituents of paints - Settling of paint - Requirements of a good paint - Emulsion paints - Latex paints - Paint removers - Varnishes - Solvents and thinners.

(6 hours)

****self study portion***

TEXT BOOKS

1. Sharma B.K., **Industrial Chemistry,** Goel Publishing House, Meerut, 2003.
2. Jain & Jain., **Engineering Chemistry,** Dhanpat Rai Publishing Company Private Ltd, New Delhi, 1998. .

REFERENCE BOOKS

1. J.R. Kapuria, **Paint Manufacture**, SBP Board of Consultants and Engineers PVT Ltd., New Delhi, 1996.
2. M.M. Uppal, **A Text Book of Engineering Chemistry**, Khanna Publishers, New Delhi, 1998.
3. R. Gopalan, D. Venkappayya, S. Nagarajan, **Engineering Chemistry**, Vikas Publishing House PVT Ltd., Reprint 2000.
4. H. L. Whitc, **Introduction to Industrial Chemistry**, A Wiley Interscience Publication (John Wiley & Sons), 1986.

Subject code : 14UCH609

SEMESTER - VI

CORE CHEMISTRY PAPER - IX

INORGANIC CHEMISTRY - 2

Total teaching hours: 60 **Total credits : 4**

Units	Learning objectives
I	To know about metallic properties
II	To learn about different types of solids
III	To learn about different types of symmetry
IV	To have an idea about reactions of complexes
V	To have a knowledge about bio-inorganic chemistry

UNIT-I Solid state - I

***Amorphous and crystalline solids** , symmetry in crystals, elements of symmetry of a crystal, space lattice and unit cell, Bravais lattices, seven crystal system, Designation of planes in crystals – Miller indices, close packing of identical solid spheres (CCP, FCC, HCP and BCC), radius ratio rule and shape of ionic crystal. Number of particles per unit cell and density of crystals.

(12 hours)

UNIT II 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. Alloys- substitutional and interstitial solid solutions, inter metallic compounds – Tamman's rule, Hume – Rothery rule. (12 hours)

UNIT III Symmetry of Molecules

X-ray diffraction studies of crystals –Bragg's equation –Bragg method and powder method – crystal structure of NaCl and ZnS. Symmetry elements in crystals (with respect to cubic crystals). X-ray diffraction in liquid.

Symmetry in molecules –symmetry elements and symmetry operation in simple molecules. (NH_3, H_2O, CO_2). (12 hours)

UNIT - IV

Coordination Chemistry

Ligand substitution reactions in octahedral complexes - SN_1 and SN_2 mechanisms.

Ligand substitution reactions in Square – planar complexes : trans effect – trans effect series, theories of trans effect – Electrostatic polarization theory and pi bonding theory.

Electron transfer reactions – Inner sphere and outer sphere mechanism, Complementary and non complementary electron transfer reaction. (12 hours)

UNIT – V

Bioinorganic chemistry

Porphyrin systems-Myoglobin and hemoglobin-Role of myoglobin and hemoglobin in biological systems – cooperativity effect – explanation of cooperativity effect in hemoglobin-metallo enzymes – 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

TEXT BOOKS

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

REFERENCE BOOKS

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

Subject code : 14UCH610

SEMESTER - VI

CORE CHEMISTRY PAPER - X

ORGANIC CHEMISTRY - 2

Total teaching hours: 60 **Total credits : 4**

Units	Learning objectives
I	To have an idea about terpenoids
II	To have an idea about alkaloids
III	To know further about Vitamins and Hormones
IV	To know the basics in carbohydrates
V	To have an idea about poly nuclear aromatic compounds

UNIT –I

Terpenoids

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

(12 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.

(12 hours)

UNIT III

Vitamins and Hormones

Introduction, classification, sources of Vitamins and their deficiency diseases. Structural elucidation and synthesis of Retinol and Ascorbic acid.

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

(12 hours)

UNIT-IV

Carbohydrates - Introduction, classification, Monosaccharides - occurrence, preparation, structural elucidation, properties, 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-V

Benzene – Preparation, physical and chemical properties. Electrophilic substitution reactions, addition reactions and oxidation reactions. Uses of benzene.

Preparation, physical properties, chemical properties and uses of naphthalene, anthracene and phenanthrene.

(12 hours)

self study portion

TEXT BOOKS

1. Arun Bahl and B.S.Bahl, **Advanced Organic Chemistry,** S. Chand and Co., New Delhi, 2012.
2. **Modern Organic Chemistry** M. K. Jain and S. C. Sharma, Rivised Edition, Vishal Publishing Co., Delhi 2011.

REFERENCE BOOKS

1. Jagdamba Singh and Yadav, **Organic Chemistry,** Vol. I and II, Pragathi Prakasam Publishers 1st Edition. 2005.
2. I. L. Finar, **Organic Chemistry,** Vol. I and Vol.II, Addison-Wesley Longman, 2010.
3. Gurdeep Chatwal, **Organic Chemistry of Natural Products,** Himalaya Publishing House, New Delhi, 2013.
4. Morrison R.T. and Boyd R.N, **Organic Chemistry** (6th edition), New York, Allyn & Bacon Ltd., 2008.

Subject code : 14UCH611

SEMESTER - V

CORE CHEMISTRY PAPER - XI

PHYSICAL CHEMISTRY - 2

Total teaching hours: 60 **Total credits : 4**

Units	Learning objectives
I	To understand the basics of chemical kinetics
II	To study the theoretical aspects of various orders and the relationship between temperature and rate of a reaction
III	To learn about activation energy and complex thermal reactions and to have an idea about photochemical reactions
IV	To gain knowledge about catalytic reactions and importance of catalysts
V	To know the action of colloids and their role in daily life

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

Catalysis – types of catalysis – homogeneous catalysis – heterogeneous catalysis – Characteristics of catalytic reactions – Promoters – Catalytic poisoning – Auto catalysis – Negative catalysis – Activation energy and Catalysis – Theories of catalysis – Intermediate Compound Formation Theory, Adsorption Theory - Hydrogenation of ethylene in presence of Nickel – Acid-base catalysis – Enzyme catalysis – Mechanism of enzyme catalysis – Industrial applications of Catalysts. (12 hours)

UNIT- V

Colloids

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

****self study portion***

TEXT BOOKS

1. Arun Bahl and B. S. Bahl, G. D. Tuli, **Essentials of Physical Chemistry**, S. Chand & Co., New Delhi, 2009.
2. B. R. Puri, L. R. Sharma, and M. S. Pathania, **Principles of Physical Chemistry,** S. Chand & Co., New Delhi, 2009.
3. P. L. Soni, O. P. Dharmarha and U. N. Dash, **Textbook of Physical Chemistry**, S. Chand & Co., New Delhi, 2001.

REFERENCE BOOKS

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

Subject code : 14UCH6S4

SEMESTER - VI

SKILL BASED SUBJEC - 4

FOOD CHEMISTRY

Total teaching hours: 30 **Total credits : 3**

Units	Learning objectives
I	To have an idea about food adulteration
II	To gain knowledge about food preservation techniques
III	To understand the chemistry of vinegar, fruit juices and vegetable acids
IV	To get an idea about beverages
V	To understand the calorific value of foods

UNIT- I

FOOD ADULTERATION AND HYGIENE:

***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 – Toxicants naturally occurring in some foods – Insect and rodent contamination of stored foods. (6 hours)

UNIT- II

PRESERVATION OF FOOD

Introduction - Chemical Preservatives - Cold Storage - Foods preserved in Tinned Iron and Glass Containers - Inspection of Tinned foods - The action of Tinned foods on the container. Poisonous Metals in foods - Detection and determination of Tin, Lead and Copper, Zinc and Aluminium in foods - Arsenic in foods - The Gutzeit test for Arsenic – Examination of glucose for the presence of Arsenic, Antimony in beverages. (6 hours)

UNIT- III

VINEGAR, FRUIT JUICES AND VEGETABLE ACIDS

Preparation and properties of Vinegar. Examination of Vinegar – Determination of Total Solids and examination of residue, Total acidity, Mineral acids in Vinegar, Colour reactions for the detection of mineral acids, 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., (6 hours)

UNIT -IV

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

THE CALORIFIC VALUE OF FOODS

Introduction - The Bomb Calorimeter - Determination of the Calorific Value of a Substance, Outline of Method - Determination of the Water Equivalent of the Apparatus - Determination of the Calorific Value of Olive Oil and of Cooked Potato. (6 hours)

self study portion

TEXT BOOKS

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

REFERENCE BOOKS

1. M. Swaminathan, **Handbook of Food and Nutrition**, The Bangalore Printing and Publishing Co. Ltd, 5th Edition,2003.
2. B. Sri Lakshmi, **Food Science**, New Age International Pvt. Ltd., 3rd Edition, New Delhi, 2003.
3. S. D. Venkataiah, **Nutrition Education**, Anmol Publication Pvt. Ltd., 2004.

Subject code: 14UCH6CN

SEMESTER V & VI

CORECHEMISTRY PRACTICAL - III

Total teaching hours: 90 **Total credits: 3**

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 diethlyglyoxime.

BOOKS FOR REFERENCE

1.Venkateswaran.V, Veeraswmay. R, Kulandaivelu. A.R., **Basic Principles of Practical Chemistry**, 2nd Edition, NewDelhi, Sultan Chand and Sons, (1997).

2. Mendham. J, Denney, R.C. Bames. J.D and Thomas. M, **Vogel's Text book of** Quantitative **Analysis**, 6th Edition, Pearson Education, 1989.

3. Gopalan.R, Subramaniam P.S and Rengarajan. K, **Elements of Analytical Chemistry,** Sultan Chand and Sons, 2004.

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.

Subject code : 14UCH6CO

SEMESTER V & VI

CORECHEMISTRY PRACTICAL - IV

Total teaching hours: 90 **Total credits : 3**

I. 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 ester (Methyl acetate OR Ethyl acetate)
3. Determination of K_f / Molecular weight by Rast 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 $SrCl_2.6H_2O$
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 Copper by colorimetric method
14. Estimation of Iron by colorimetric method.
15. Estimation of Manganese by colorimetric method.

REFERENCE BOOKS

1. Venkateswaran.V, Veeraswamy. R, Kulandaivelu. A.R., **Basic Principles of Practical Chemistry**, 2nd Edition, NewDelhi, Sultan Chand and Sons, 1997.

2. Gopalan. R, Subramaniam. P.S., and Rengarajan, K., **Elements of Analytical Chemistry,** Sultan Chand and Sons, 2004**.**

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 H_2SO_4, 0.5N to be given. If the order of difference between theoretical and candidates value is

Below a factor of 10 -37

Between 10-20 - reduce 3 marks for each factor

Above 20 -5 marks

4. Critical Solution Temperature of Phenol-Water system is 67.0 ^{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

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
Corrcet 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. Dicholorobenzene

For each step error has to be worked out

Melting point of solvent - 07

Error upto ±10% - 30

Error upto ±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

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

Subject code : 14UCH6CP

SEMESTER V & VI

CORECHEMISTRY PRACTICAL - V

Total teaching hours: 120 **Total credits : 4**

I. **Determination of Physical Constants.**

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

II. Preparation of Organic dyes

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

III. Preparation of Organic Compounds

1. 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
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., **Basic Principles of Practical Chemistry**, 2nd Edition, New Delhi, Sultan Chand and Sons, 1997.
2. Mendham. J., Denney. R.C., Bames. J.D. and Thomas, M. **Vogel's Text Book of Quantitative Analysis**, 6th Edition, Pearson Education.
3. Sharma, K.K. and Sharma, D.S. **Introduction to Practical Chemistry**, Vikas Publishing House, New Delhi, 2005.
4. Praveen Kukreja, **Chemistry Advanced Practical Manual,** Vrinda Publishing (p) Ltd, New Delhi, 2006.

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)

±2°	10
±3°	8
±4°	6
±>4°	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

MAJOR ELECTIVE - 1
(POLYMER CHEMISTRY)

Units	Learning objectives
I	To know about the types of polymers and polymerization
II	To understand the physical properties of polymers - reaction - degradation
III	To know about polymerization techniques and polymer processing
IV	To know some individual polymers
V	To have an idea about recent advances in polymer science

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 polymers – plastics, elastomers, fibers and liquid resin.

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 (Tg): Definition, Transition and Associated properties, Factors influencing the glass transition temperature.

Photo oxidative degradation of polymers. (9 hours)

UNIT-III Polymerization Techniques and Processing

Polymerization techniques: Bulk, Solution, Suspension, Emulsion and Interfacial poly condensation polymerization.

Polymer Processing: Introduction – plastic, elastomers and fibers. Processing Techniques-Calendaring – Die Casting – Rotational Casting – Film Casting – compression moulding – injection Moulding. (9 hours)

UNIT-IV Chemistry of Commercial Polymers

General methods of preparations, Properties and uses of the following polymers: Polystyrene, polymethylmethacrylate, polyesters, polyamides (Kevelar), Polyurethanes, Poly vinyl Chloride, Phenol Formaldehyde resin, Urea Formaldehyde resins, Epoxy resins, Teflon.

(9 hours)

UNIT-V Advances in Polymers

Biopolymers: Cellulose – Rayon – Cellophane, Cellulose Nitrate – Carboxy Methyl cellulose. Siliciones.

Applications of polymers: Biomedical applications, Drug delivery, artificial organs, Electronic Applications - Conducting polymers with examples.

(9 hours)

self study portion

Text Book

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

Reference Books

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

MAJOR ELECTIVE - 2

NANO AND GREEN CHEMISTRY

Units	Learning objectives
I	To understand the basics of Nano Chemistry
II	To know the methods to prepare Nano materials
III	To have an idea about Green Chemistry and its limitations
IV	To gain knowledge about Green solvents in laboratory and also in Industry
V	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)

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.

MAJOR ELECTIVE - 3

DYE CHEMISTRY

Units	Learning objectives
I	To understand the basic concepts of dye chemistry
II	To know basic terms of Dye Chemistry
III	To have a knowledge about classification of dyes
IV	To get into the preparation of dyes
V	To know the chemistry of pigments

UNIT- I

Introduction to the dyes

*** Requisites of true dyes.** Textiles fibres, Dyeing - ionic interaction, hydrogen bond vanderwalls interaction and covalent bonds. Basics operation in the dyeing process, various methods of dyeing - Direct, vat, mordant and disperse dyeing, formation of the dye on the fibre, dyeing of the wool with acid dyes and dyeing with reactive dyes. Fastness properties- colour, light, sublimation and burnt gas fumes fastness**.** (9 hours)

UNIT-II

Colour and constitution

Colour and constitution – Relationship of colour observed to wave length of light observed – terms used in colour chemistry – Chromophores, Auxochromes, Bathochromic shift and Hypsochromic shift. Colour of a substance –quinonoid theory, molecular orbital theory

(9 hours)

UNIT- III

Classification of dyes

Classification according to their applications - acid dyes, basic dyes, azoic dyes, mordant dyes, vat dyes, sulphur dyes and disperse dye.s. Azo dyes – principles governing azo coupling – mechanism of diazotisation – coupling with amines, coupling with phenols. Types of azo dyes – acidic azo dyes (methyl orange,metanil yellow), basic azo dyes (bismark brown,chrysodine G), direct dyes (congo red). (9 hours)

UNIT- IV

Preparation of dyes

Synthesis, reactions and applications of Diphenyl methane dyes (Auramine O Auramine G) and Triphenyl methane dyes (Malachite green, pararosaniline, crystal violet), phthalein dyes (Phenolphthalein, Phthalein), Xanthene dyes (Fluorescein, Eosin), acridine dyes (Acridine Orange NO) ,sulphur dyes, Phthalocyanines, Cyanine dyes. (9 hours)

UNIT-V

Pigments and non-textile applications

Pigments – requirements of a pigment. Typical organic and inorganic pigments – applications and their uses in paints. Reaction of dyes with fibres and water – fluorescent brightening agents. Application of dyes in other areas- medicine, chemical analysis, cosmetics, colouring agents, food and beverages. (9 hours)

self study portion

TEXT BOOKS

1. Gurdeep Chatwal , **Synthetic Dyes**, Himalaya Publishing House, New Delhi, 1990.
2. M.G.Arora, **Text Book of Dyes**, Anmol Publications Private Ltd. New Delhi, 1996.

REFERENCE BOOKS

1. E.N. Abraham, **Dyes and Their Intermediates**, Bergamon Press, 1969.
2. H. A. Lubs, **The Chemistry of synthetic dyes and pigments**, ACS publication, Halner, 1970.
3. K.Venkataraman, **The Chemistry of Synthetic Dyes, Vol.I, II, III & IV**, Academic Press N.Y., 1949.
4. F. P. Schafer, **Physical and Chemical Applications of Dyestuffs**, Springer – Veriag N.Y., 1976.
5. I.L Finar, **Organic Chemistry,** Vol II, ELBS, 2009.

MAJOR ELECTIVE - 4
PHARMACEUTICAL CHEMISTRY

Units	Learning objectives
I	To know about the common diseases and cure-terms of pharmacology
II	To understand the mechanism of drug action
III	To get introduced to chemotherapy - antibiotics
IV	To know the drugs meant for diabetes-BP-cholesteraleemia
V	To have knowledge 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 constitutents 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, tetrecyclins-Antivirals, AIDS- symptoms, prevention, treatment- Cancer and neoplastic agents.

(9 hours)

UNIT IV

Common Body Ailments

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

UNIT V

Health Promoting Drugs

Nutracenticals- 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 pitutary function (metyrapone)- Organic Pharmaceutical bases-anti oxidants, treatment of ulcer and skin diseases. (9 hours)

self study portion

TEXT BOOKS

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

REFERENCE BOOKS

1. Lakshmi S., **Pharmaceutical Chemistry,** S. Chand & Sons, New Delhi, 1995.
2. Ashutosh Kar, **Medicinal Chemistry,** Wiley Eastern Ltd., New Delhi, 1993.
3. David William & Thomas Lemke, **Principles of Medicinal Chemistry,** Foyers, 5th Edition BI publishers, 2005.
4. Romas Nogrady, **Medicinal Chemistry,** II Edition, Oxford Univ. Press., 2004 .

MAJOR ELECTIVE - 5
AGRICULTURAL CHEMISTRY

Units	Learning objectives
I	To understand the basic soil chemistry
II	To know the physical properties of soils etc
III	To know the chemistry aspects of soil – nitrogen fixation
IV	To understand various nutrients present in soil- waste for one, food for another
V	To know the chemistry of 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 and distribution –soil organism –their role-nitrification-denitrification, nitrogen fixation in soils-biological nitrogen fixation in soils –microbial interrelationship in soil-microbes in pert 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, azotobactor-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-Reppellants-Fumiganus defoliants.

(9 hours)

self study portion

TEXT BOOKS

1. Biswas ,T.D and Mukeherjee, S.K. **Textbook of Soil Science,** 1987.

2. Daji, A.J. **Textbook of Soil Sciences,** Asia Publishing House, Madras, 1970.

3. Tisdale. S. L., Nelson. W. L. and Beaton. J. D. **Soil Fertility and Fertilizers,** Macmillan Publishing Company, New York, 1990.

REFERENCE BOOKS

1. HESSE , **A Textbook of Soil Chemical Analysis** P.R. John Murray, 1971.

2. Buchel, K.H. John Wiley & Sons , **Chemistry of Pesticides,** New York, 1983.

3. Sree Ramula, **Chemistry of Insecticides and Fungicides Chemistry of Insecticides and Fungicides,** U.S. Oxford and IBH Publishing Co., New Delhi, 1979.

JOC - TEXTILE CHEMISTRY

Units	Learning objectives
I	To understand the natural fibres – vegetable fibres – animal fibres- properties
II	To know about synthetic fibres – manufacture - properties
III	To acquire knowledge about scouring and desizing – singeing processes
IV	To have a clear idea about latest bleaching techniques
V	To have knowledge about dyeing- synthesis of dyestuffs -fastness properties

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 Na_2CO_3 -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-H_2O_2, 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- congored, 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 & REFERENCE BOOKS

1. Shenai. V.A. **Textile Fibres (Vol. I),** Mahajan Publishers, Ahmedabad, 1991.
2. Shenai. V.A., **Technology of Beaching,** Mahajan Publishers, Ahmedabad, 1998.
3. Shenai. V.A., **Chemistry of Dyes and Principles of Dyeing Vol. II,** Mahajan Publishers, Ahmedabad, 1991.
4. Gopalakrishnan. R. **Textile Fibres SSM,** Institute of Textile Technology, Mahajan Publishers, Ahmedabad, 1988.

Subject code : 14UCH1A1 / 14UCH3A3

SEMESTER - I/ III

ALLIED CHEMISTRY PAPER - I

Total teaching hours: 60 **Total credits : 4**

Units	Learning objectives
I	To learn the preparation and properties of inorganic compounds.
II	To know the chemistry of Fertilizers
III	To learn the hybridization and isomerism
IV	To know the Chemistry of some useful organic compounds
V	To understand and apply the concept of rate equation

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 H_2, N_2, O_2 and F_2.
2. Inter halogen Compounds - Types of Inter halogen Compounds. Preparation, properties, uses and Structures of ICl, BrF_3 and IF_5.
3. Compounds of Sulphur - Preparation, properties, uses and Structures of Sodium hydrosulphite and Peracids of Sulphur. (12 hours)

UNIT-II

Industrial Chemistry

1. ***Silicones - Types, Preparation, properties and uses**.
2. 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).
3. 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)

UNIT-III 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-IV Chemistry of some useful organic compounds

1. Preparation of some important Chlorohydrocarbons CH_2Cl_2, $CHCl_3$, CCl_4 which are used as solvents and pesticides- Chlorofluorocarbons, DDT, BHC and Freon's.
2. Dyes - Terms used - Classification based on application one example for each. Azo and triphenyl methane dyes, Food colours.
3. Synthetic polymers - Teflon, alkyl resin, polyesters, epoxy resin - General treatment.

(12 hours)

UNIT-V Introduction to Chemical Kinetics

1. Introduction - 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.
2. Order of a reaction - integrated rate expression for first, second and zero order reactions - examples.
3. Determination of order of reactions - Integrated method, Half - life method, Graphical method, Oswald's method
4. Molecularity of a reaction - Pseudo unimolecular reaction- Difference between order and molecularity of a reaction.
5. Effect of temperature on reaction rate - Theories of reaction rates - Collision theory- Limitations-

Transition or activated complex theory - concept of activation energy - Arrhenius equation - calculation of Ea using Arrhenius equation - Effect of catalyst of a reaction rate.

(12 hours)

self study portion

TEXT BOOKS

1. B. Veeraiyan, **Textbook of Ancillary Chemistry**, High mount Publishing House, Chennai, 1990.
2. Vaithyanathan. S **Textbook of Ancillary Chemistry**, Priya Publications, Karur, 2011.

REFERENCE BOOKS

1. B.S.Bahl, G.D. Tuli and Arun Bahl, **Essentials of Physical Chemistry**. S. Chand & Co., New Delhi, 2009.
2. Jain and Jain, **Engineering Chemistry**, Dhanpat Rai Publishing Co., 1998.
3. B.R. Puri, L.R. Sharma and S. Pathania, **Principles of Physical Chemistry**, Vishal Publishing Co., Jalandhar, 2005.
4. Soni P.L, **Text Book of Inorganic Chemistry**, Sultan Chand & Co., New Delhi, 2006.
5. Soni P.L, **Text Book of Organic Chemistry**, Sultan Chand & Co, New Delhi, 2006.

Subject code : 14UCH2A2 / 14UCH4A4

SEMESTER - II/ IV

ALLIED CHEMISTRY PAPER - II

Total teaching hours: 60 **Total credits : 4**

Units	Learning objectives
I	To know the Applications of Coordination complexes
II	To understand the preparation and properties of heterocyclic compounds
III	To learn the biological function of Nucleic acids
IV	To learn different Thermodynamic processes
V	To study the nature of electricity and conductance.

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

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 - V 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)

self study portion

TEXT BOOKS

1. B. Veeraiyan, **Textbook of Ancillary Chemistry**, High mount Publishing House, Chennai, 1990.
2. Vaithyanathan. S **Textbook of Ancillary Chemistry**, Priya Publications, Karur, 2011.

REFERENCE BOOKS

1. B.S.Bahl, G.D. Tuli and Arun Bahl, **Essentials of Physical Chemistry**. S. Chand & Co., New Delhi, 2009.
2. Jain and Jain, **Engineering Chemistry**, Dhanpat Rai Publishing Co., 1998.
3. B.R. Puri, L.R. Sharma and S. Pathania, **Principles of Physical Chemistry**, Vishal Publishing Co., Jalandhar, 2005.
4. Soni P.L, **Text Book of Inorganic Chemistry**, Sultan Chand & Co., New Delhi, 2006.
5. Soni P.L, **Text Book of Organic Chemistry**, Sultan Chand & Co, New Delhi, 2006.

Subject code : 14UCH2AL/ 14UCH4AL

SEMESTER III & 1V

ALLIED CHEMISTRY PRACTICAL - I

Total teaching hours: 90 **Total credits : 2**

Volumetric Analysis

1. Estimation of Sodium hydroxide using standard Sodium Carbonate Solution
2. Estimation of Hydrochloric acid-standard Oxalic acid Solution
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 tested for Phenols, acids, (mono and di), aromatic primary amine, amide, Diamide, dextrose.
5. Systematic analysis of Organic compounds containing one functional group and characterization by confirmatory tests.

REFERENCE BOOKS

1. V. Venkateswaran, R. Veeraswmay, A.R. Kulandaivelu, **Basic Principles of Practical Chemistry**, 2nd Edition, New Delhi, Sultan Chand and Sons, 1997.

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