G. VENKATASWAMY NAIDU COLLEGE, KOVILPATTI-628502

(AUTONOMOUS)

(Re-Accredited with "A" Grade by NAAC)

(Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India)

CURRICULAM FOR B.Sc. CHEMISTRY PROGRAMME

(for those who joined from the Academic year 2023-2024 and onwards)

(under Choice Based Credit System & Outcome Based Education Pattern)

G. VENKATASWAMY NAIDU COLLEGE, KOVILPATTI-628502

(AUTONOMOUS)

(Re-Accredited with "A" Grade by NAAC)

Department of Chemistry

(for those who joined from the Academic year 2023-2024 and onwards)

VISION

- Envisions to empower young learners with the State of the Art Chemistry Education and enabling them to attain global standards so that they can contribute to National Development as active researchers, academicians, industrialists and entrepreneurs.

MISSION

- ✓ Developing basic knowledge in Chemistry by providing practical experience.
- ✓ Imparting knowledge for holistic development by including social orientation and ethics.
- ✓ Instilling scientific zeal, leadership skills and employable skills in students to meet contemporary challenges.
- ✓ Making the students self-reliant by starting their own business through in-plant trainings and mini projects.

PROGRAMME OUTCOMES (PO)

- Students will possess basic subject knowledge required for higher studies, professional and applied courses
- Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the science & humanities stream.
- Students will develop scientific aptitude Integrate skills of analysis, critiquing, application and creativity.
- Students will employ appropriate digital tools and techniques necessary in analyzing data and creative design.

- Students will gain competence to pursue higher learning, research and careers or will be able to opt for entrepreneurship
- Students will interact meaningfully with others displaying leadership and coordination in executing projects.
- Students will demonstrate responsibility as citizens committed to national development through community outreach, wellness of self and a sustainable environment.

PROGRAMME EDUCATIONAL OBJECTIVES

After successful completion of the three year degree programme in Chemistry, the student will have ability to

PEO-1: demonstrate technical competency in various disciplines of Chemistry and will be successful in his / her chosen careers.

PEO-2: demonstrate commitment towards sustainable development for the benefit of Society

PEO-3: demonstrate professional excellence, ethics, soft skills and leadership qualities.

PROGRAMME SPECIFIC OUTCOMES

PSO1: Students acquire in-depth knowledge of the fundamental concepts in all disciplines of chemistry.

PSO2: Students can disseminate the basics of chemistry and advanced topics and analytical skills in organic, inorganic and physical chemistry.

PSO3: Students will be able develop creativity in academics and research.

PSO4: Students will be able apply digital tools to collect, analyse and interpret data and present scientific findings.

PSO5: gain competence to pursue higher education and career opportunities in chemistry and allied fields.

PSO6: exhibit leadership qualities to work individually and within a team in organizing curricular, co-curricular and extracurricular activities.

PSO7: apply the concepts of chemistry to solve problems in the community, entrepreneurial and research pursuits.

PSO8: exhibit competence in educational, industrial and research pursuits that contribute towards the holistic development of self and community.

GRADUATE ATTRIBUTES

The three year under-graduate programme in Chemistry develops transferable life skills such as

1) Discipline knowledge

The Graduates will be able to demonstrate an in-depth knowledge and understanding of essential facts, concepts and basic principles of Chemistry and have ability to acquire new knowledge and apply it to find solutions to problems encountered in day to day activities.

2) Experimental Skills

The Graduates will acquire skills required for the conduct of documented evidence based laboratory experiments, make observations, draw inferences from the observations and apply the results to improve the processes.

3) Critical thinking

The Graduates will be able to employ scientific knowledge and critical thinking to analyze the experimental results and draw a conclusion based on scientific evidence.

4) Safe handling of Chemicals

The Graduates will be able to identify the hazardous chemicals by knowing their physical and chemical properties and will be aware of the safe handling techniques.

5) **Ethical and Social values**

The Graduates will be aware of the ethical and social implications and obligations of Chemistry and will be able to find out pollution free green routes to chemical reactions for sustainable development.

6) **Digital Literacy and Life long learning**

The graduates will be able to demonstrate good working knowledge in the use of computers and able to upgrade skills by independent life long learning via e-learning resources.

7) **Soft Skills**

The Graduates will be able to gather and present information and demonstrate effective communication skills, problem solving, and decision making and leadership skills and will be able to work in teams.

Curriculum Design for B.Sc. Chemistry Programme(First Year)

Category	Course Type	Course Code	Course Title	Contact Hours	Exam Hours	Marks			Credits
						CIA	**ESE**	**Total Marks**	
Semester-1									
PART-I	Language	U23TA1L1	Tamil –I	6	3	25	75	100	3
PART-II	English	U23EN1L1	English – I	6	3	25	75	100	3
PART-III	Core – 1	U23CH101	General Chemistry – I	5	3	25	75	100	5
	Core Practical – 1	U23CH2P1	Quantitative Inorganic Estimation (Titrimetry) and Inorganic Preparations	3	3	40	60	100	3
	Elective Generic – 1 (Allied)	U23MA1A1	Mathematics	6	3	25	75	100	4
		U23ZO1A1	Zoology	4	3	25	75	100	3
		U23ZO2AP	Zoology Practical	2	3	40	60	100	1
PART-IV	Skill Enhancement Course -1 (NME-1)	U23CH1S1A	Food Chemistry	2	-	50	-	50	2
		U23CH1S1B	Role of Chemistry in Daily Life						
	Foundation Course	U23CHFC1	Introductory Chemistry	2	-	50	-	50	2
TOTAL				**30**				**600 / 700**	**22**
Semester-II									
PART-I	Language	U23TA2L2	Tamil-II	6	3	25	75	100	3
PART-II	English	U23EN2L2	English – II	6	3	25	75	100	3
PART-III	Core – 2	U23CH202	General Chemistry–II	5	3	25	75	100	5
	Core Practical - 2	U23CH2P2	Qualitative Organic Analysis and preparation of Organic Compounds	3	3	40	60	100	3
	Elective-Generic-2 (Allied)	U23MA2A2	Mathematics	6	3	25	75	100	4
		U23ZO2A2	Zoology	4	3	25	75	100	3
	Elective Generic Practical –1 (Allied)	U23ZO2AP	Zoology Practical	2	3	40	60	100	1
	Comprehension - I (Self Study Course- Online Examination)	U23CH2C1	Comprehension in Chemistry – I	-	1	-	50	50	1
PART-IV	Skill Enhancement Course -2 (NME-2)	U23CH2S2	Dairy Chemistry	2	-	50	-	50	2
	Skill Enhancement Course -3 (Discipline Specific)	U23CH2S3	Cosmetics and Personal Grooming	2	2	-	50	50	2
TOTAL				**30**				**650 /750**	**23**

Part-III B.Sc. Chemistry / Semester – I / Core-1: GENERAL CHEMISTRY-I (U23CH101)

Lecture Hours	**: 60**	**Tutorial Hours**	**: 15**
Practical Hours	**: -**	**No. of Credit**	**: 05**
Contact Hours per Semester	**: 75**		
Contact hours per Week	**: 05**		
Internal Marks	**: 25**		
External Marks	**: 75**		
Total Marks	**: 100**		

Objectives of the Course

The Course aims at giving an overall view of the

- various atomic models and atomic structure
- wave particle duality of matter
- periodic table, periodicity in properties and its application in explaining the chemical behavior
- nature of chemical bonding, and
- fundamental concepts of organic chemistry

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: explain the atomic structure, wave particle duality of matter, periodic properties bonding, and properties of compounds.

CO2: classify the elements in the periodic table, types of bonds, reaction intermediates electronic effects in organic compounds, types of reagents.

CO3: apply the theories of atomic structure, bonding, to calculate energy of a spectral transition, Δx, Δp electronegativity, percentage ionic character and bond order.

CO4: evaluate the relationship existing between electronic configuration, bonding, geometry of molecules and reactions; structure reactivity and electronic effects

CO5: construct MO diagrams, predict trends in periodic properties, assess the properties of elements, and explain hybridization in molecules, nature of H – bonding and organic reaction mechanisms.

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

CO-PSO Mapping (Course Articulation Matrix)

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Course Content

UNIT I

Atomic structure and Periodic trends (L-12Hrs; T-3Hrs)

History of atom (J.J.Thomson, Rutherford); Moseley's Experiment and Atomic number, Atomic Spectra; Black-Body Radiation and Planck's quantum theory - Bohr's model of atom; The Franck-Hertz Experiment; Interpretation of H- spectrum; Photoelectric effect, Compton effect; Dual nature of Matter- De- Broglie wavelength-Davisson and Germer experiment Heisenberg's Uncertainty Principle; Electronic Configuration of Atoms and ions- Hund's rule, Pauli'exclusion principle and Aufbau principle; Numerical problems involving the core concepts**.**

Unit II

Introduction to Quantum mechanics (L-12Hrs; T-3Hrs)

Classical mechanics, Wave mechanical model of atom, distinction between a Bohr orbit and orbital; Postulates of quantum mechanics; probability interpretation of wave functions, Formulation of

Schrodinger wave equation - Probability and electron density-visualizing the orbitals -Probability density and significance of Ψ and Ψ^2.

Modern Periodic Table

Cause of periodicity; Features of the periodic table; classification of elements - Periodic trends for atomic size- Atomic radii, Ionic, crystal and covalent radii; ionization energy, electron affinity, electronegativity-electronegativity scales, applications of electronegativity.

Problems involving the core concepts

UNIT-III: Structure and bonding – I (L-12Hrs; T-3Hrs)

Ionic bond

Lewis dot structure of ionic compounds; properties of ionic compounds; Energy involved in ionic compounds; Born Haber cycle – lattice energies, Madelung constant; relative effect of lattice energy and solvation energy; Ion polarisation– polarising power and polarizability; Fajans' rules - effects of polarisation on properties of compounds; problems involving the core concepts.

Covalent bond

Shapes of orbitals, overlap of orbitals – σ and Π bonds; directed valency -hybridization; VSEPR theory - shapes of molecules of the type AB_2, AB_3, AB_4, AB_5, AB_6 and AB_7 Partial ionic character of covalent bond-dipole moment, application to molecules of the type A_2, AB, AB_2, AB_3, AB_4; percentage ionic character- numerical problems based on calculation of percentage ionic character.

UNIT-IV: Structure and bonding – II (L-12Hrs; T-3Hrs)

VB theory – application to hydrogen molecule; concept of resonance - resonance structures of some inorganic species – CO_2, NO_2, CO_3^{2-}, NO_3^- ; limitations of VBT; MO theory - bonding, antibonding and nonbonding orbitals, bond order; MO diagrams of H_2, C_2, O_2, O_2^+, O^{2-}, $O^{2-}N_2$, NO, HF, CO; magnetic characteristics, comparison of VB and MO theories.

Coordinate bond: Definition, Formation of BF_3, NH_3, NH_4^+, H_3O^+ properties

Metallic bond-electron sea model, VB model; Band theory-mechanism of conduction in solids; conductors, insulator, semiconductor – types, applicationsof semiconductors

Weak Chemical Forces - Vander Waals forces, ion-dipole forces, dipole-dipole interactions, induced dipole interactions, Instantaneous dipole-induced dipole interactions. Repulsive forces; Hydrogen bonding – Types, special properties of water, ice, stability of DNA; Effects of chemical force, melting and boiling points.

UNIT-V:

Basic concepts in Organic Chemistry and Electronic effects (L-12Hrs; T-3Hrs)

Types of bond cleavage – heterolytic and homolytic; arrow pushing in organic reactions; reagents and substrates; types of reagents - electrophiles, nucleophiles, free radicals; reaction intermediates – carbanions, carbocations,carbenes, arynes and nitrynes.

Inductive effect - reactivity of alkyl halides, acidity of halo acids, basicity of amines; inductomeric and electromeric effects.

Resonance – resonance energy, conditions for resonance - acidity of phenols, basicity of aromatic amines, stability of carbonium ions, carbanions and free radicals, reactivity of vinyl chloride, dipole moment of vinyl chloride andnitrobenzene, bond lengths; steric inhibition to resonance.

Hyper conjugation - stability of alkenes, bond length, orienting effect of methylgroup, dipole moment of aldehydes and nitromethane

Types of organic reactions - addition, substitution, elimination and rearrangements

Questions related to the above topics, from various competitive examinationsUPSC/JAM /TNPSC and others to be solved

(To be discussed during the Tutorial hours. Not to beincluded in the external examination question paper)

Recommended Text

1. Madan, R. D. and Sathya Prakash, *Modern Inorganic Chemistry*, 2nd ed.; S. Chand and Company: New Delhi, 2003.
2. Rao, C.N. R. University General Chemistry, Macmillan Publication: NewDelhi, 2000.
3. Puri, B. R. and Sharma, L. R. *Principles of Physical Chemistry*, 38th ed.; Vishal Publishing Company: Jalandhar, 2002.
4. Bruce, P. Y. and Prasad K. J. R. *Essential Organic Chemistry*, Pearson Education: New Delhi, 2008.
5. Dash UN, Dharmarha OP, Soni P.L. Textbook of Physical Chemistry, Sultan Chand & Sons: New Delhi, 2016

Reference Books

1. Maron, S. H. and Prutton C. P. *Principles of Physical Chemistry*, 4th ed.; The Macmillan Company: Newyork, 1972.
2. Lee, J. D. *Concise Inorganic Chemistry*, 4th ed.; ELBS WilliamHeinemann: London, 1991.

3. Gurudeep Raj, *Advanced Inorganic Chemistry,* 26th ed.; Goel PublishingHouse: Meerut, 2001.
4. Atkins, P.W. & Paula, J. *Physical Chemistry*, 10th ed.; Oxford University Press: New York, 2014.
5. Huheey, J. E. *Inorganic Chemistry: Principles of Structure and Reactivity*, 4th ed .; Addison, Wesley Publishing Company: India,1993.

Website ande-learning source

1) https://onlinecourses.nptel.ac.in
2) http://www.mikeblaber.org/oldwine/chm1045/notes_m.html
3) http://www.ias.ac.in/initiat/sci_ed/resources/chemistry/Inorganic.html
4) https://swayam.gov.in/course/64-atomic-structure-and-chemical-bonding
5) https://www.chemtube3d.com/

Part-III B.Sc. Chemistry / Semester – I / Core Practical -I: Quantitative Inorganic Estimation (Titrimetry) and Inorganic Preparations (U23CH2P1)

Lecture Hours	**: -**	**Tutorial Hours**	**: -**
Practical Hours	**: 45**	**No. of Credit**	**: 02**
Contact Hours per Semester	**: 45**		
Contact hours per Week	**: 03**		
Internal Marks	**: 40**		
External Marks	**: 60**		
Total Marks	**: 100**		

Objectives of the Course

This Course aims at providing knowledge on

- laboratory safety
- handling glass wares
- Quantitative estimation
- preparation of inorganic compounds

Course Learning Outcomes (for Mapping with POs and PSOs)

On successful completion of the course the students should be able to

CO1: explain the basic principles involved in titrimetric analysis and inorganic preparations.

CO2: compare the methodologies of different titrimetric analysis.

CO3: calculate the concentrations of unknown solutions in different ways and develop the skillto estimate the amount of a substance present in a given solution.

CO4: assess the yield of different inorganic preparations and identify the end point of various titrations.

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M

CO-PSO Mapping (Course Articulation Matrix)

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
Weightage	12	12	12	12	12
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Course Content

Unit I

Chemical Laboratory Safety in Academic Institutions

Introduction - importance of safety education for students, common laboratory hazards, assessment and minimization of the risk of the hazards, prepare for emergencies from uncontrolled hazards; concept of MSDS; importance and care of PPE; proper use and operation of chemical hoods and ventilation system; fire extinguishers-types and uses of fire extinguishers, demonstration of operation; chemical waste and safe disposal.

Common Apparatus Used in Quantitative Estimation (Volumetric)

Description and use of burette, pipette, standard flask, measuring cylinder, conical flask, beaker, funnel, dropper, clamp, stand, wash bottle, watch glass, wire gauge and tripod stand.

Principle of Quantitative Estimation (Volumetric)

Equivalent weight of an acid, base, salt, reducing agent, oxidizing agent; concept of mole, molality, molarity, normality; primary and secondary standards, preparation of standard solutions; theories of acid-base, redox, complexometric, iodimetric and iodometric titrations**;** indicators – types, theory of acid–base, redox, metal ion and adsorption indicators, choice of indicators.

Unit II

Quantitative Estimation (Volumetric)

Preparation of standard solution, dilution from stock solution

Permanganometry

Estimation of sodium oxalate using standard ferrous ammonium sulphate

Dichrometry

Estimation of ferric alum using standard dichromate (external indicator)Estimation of ferric alum

using standard dichromate (internal indicator)

Iodometry

Estimation of copper in copper sulphate using standard dichromate

Argentimetry

Estimation of chloride in barium chloride using standard sodium chloride/Estimation of chloride in sodium chloride (Volhard's method)

Unit III

Complexometry

Estimation of hardness of water using EDTA

Estimations

Estimation of iron in iron tabletsEstimation of ascorbic acid.

Preparation of Inorganic compounds

Potashalum

Tetra ammine copper (II) sulphate

Hexamminecobalt (III) chloride Mohr's Salt

RecommendedText

1. Venkateswaran, V.; Veeraswamy, R.; Kulandivelu, A.R. *Basic Principles ofPractical Chemistry*, 2nd ed.; Sultan Chand &Sons: New Delhi, 1997.
2. Nad, A. K.; Mahapatra, B.; Ghoshal, A.; *An advanced course in Practical Chemistry*, 3rd ed.; New Central Book Agency: Kolkata, 2007.

ReferenceBooks

1. Mendham, J.; Denney, R. C.; Barnes, J. D.; Thomas, M.; Sivasankar, B.; *Vogel's Textbook of Quantitative Chemical Analysis*, 6th ed.; PearsonEducation Ltd: New Delhi, 2000.

Web References:

1) http://www.federica.unina.it/agraria/analytical-chemistry/volumetric- analysis
https://chemdictionary.org/titration-indicator/

Part-III B.Sc. Chemistry / Semester – I / Skill Enhancement Course -1 (Non Major Elective) FOOD CHEMISTRY (U23CH1S1A)

Lecture Hours	**:**	**30**	**Tutorial Hours: -**	
Practical Hours	**:**	**-**	**No. of Credit**	**: 2**
Contact Hours per Semester : 30				
Contact hours per Week		**: 02**		
Internal Marks		**: 50**		
External Marks		**: -**		
Total Marks		**: 50**		

Objectivesof the course

This course aims at giving an overall view of the

- Types of food
- Food adulteration and poisons
- Food additives and preservation
-

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: learn about Food adulteration - contamination of Wheat, Rice, Milk, Butter.

CO2: get an awareness about food poisons like natural poisons (alkaloids - nephrotoxin)pesticides, DDT, BHC, Malathion

CO3: get an exposure on food additives, artificial sweeteners, Saccharin, Cyclomate and Aspartate in the food industries.

CO4: acquire knowledge on beverages, soft drinks, soda, fruit juices and alcoholic beveragesexamples.

CO5: study about fats and oils - Sources of oils - production of refined vegetable oils -preservation. Saturated and unsaturated fats –MUFA and PUFA

CO-PO Mapping (Course Articulation Matrix)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M

CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

CO-PSO Mapping (Course Articulation Matrix)

CO /PO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Course Content

FOOD CHEMISTRY

UNIT I

Food Adulteration

Sources of food, types, advantages and disadvantages. Food adulteration - contamination of wheat, rice, milk, butter etc. with clay stones, water and toxic chemicals -Common adulterants, Ghee adulterants and their detection. Detection of adulterated foods by simple analytical techniques.

Unit-II

Food Poison

Food poisons - natural poisons (alkaloids - nephrotoxin) - pesticides, (DDT, BHC, Malathion) - Chemical poisons - First aid for poison consumed victims.

UNIT-III

Food Additives

Food additives - artificial sweeteners – Saccharin - Cyclomate and Aspartate Food flavours -esters, aldehydes and heterocyclic compounds – Food colours– Emulsifying agents – preservatives -leavening

agents. Baking powder –yeast – tastemakers – MSG - vinegar.

UNIT-IV

Beverages

Beverages-soft drinks-soda-fruit juices-alcoholic beverages-examples. Carbonation-addiction to alcohol–diseases of liver and social problems.

UNIT-V

Edible Oils

Fats and oils - Sources of oils - production of refined vegetable oils - preservation. Saturated and unsaturated fats - iodine value - role of MUFA and PUFA in preventing heart diseases-determination of iodine value, RM value, saponification values and their significance.

Recommended Text

1. Food chemistry, H. K. Chopra, P. S. Panesar, Narosa publishing house,2010.
2. Jayashree Ghosh, Fundamental Concepts of Applied Chemistry, S. Chand & Co. Publishers, second edition, 2006.
3. Food chemistry, H. K. Chopra, P. S. Panesar, Narosa publishning house,2010.
4. Food Chemistry, Dr. L. Rakesh Sharma, Evince pub publishing, 2022.
5. Food processing and preservation, G. Subbulakshmi, Shobha A Udipi, Pdmini S Ghugre, New age international publishers, second edition, 2021.

ReferenceBooks

1. H.-D. Belitz, Werner Grosch, Food Chemistry Springer Science & Business Media, 4th Edition, 2009.
2. M.Swaminathan, Food Science and Experimental Foods, Ganesh andCompany, 1979.
3. Hasenhuettl, Gerard. L.; Hartel, Richard. W. Food Emulsifiers and their applications Springer New York 2nd ed. 2008.
4. Food Chemistry, H.-D. Belitz, W. Grosch, P. Schieberle, Springer, fourth revised and extended edition, 2009.
5. Principles of food chemistry, John M. deMan, John W. Finley, W. Jefferey Hurst, Chang Yong Lee, Springer, Fourth edition, 2018.

Part-III B.Sc. Chemistry / Semester – I / Skill Enhancement Course -1 (Non Major Elective) ROLE OF CHEMISTRY IN DAILY LIFE (U23CH1S1A)

Lecture Hours	**: 30**	**Tutorial Hours**	**: -**
Practical Hours	**: -**	**No. of Credit**	**: 2**
Contact Hours per Semester	**: 30**		
Contact hours per Week	**: 02**		
Internal Marks	**: 50**		
External Marks	**: -**		
Total Marks	**: 50**		

Objectivesof the course

This course aims at providing an overall view of the

- importance of Chemistry in everyday life
- chemistry of building materials and food
- chemistry of Drugs and pharmaceuticals

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: learn about the chemicals used in everyday life as well as air pollution and waterpollution.

CO2: get knowledge on building materials cement, ceramics, glass and plastics, polythene, PVC bakelite, polyesters,

CO3: acquire information about Food and Nutrition. Carbohydrates, Proteins, Fats Also have awareness about Cosmetics Tooth pastes, face powder, soaps and detergents.

CO4: discuss about the fertilizers like urea, NPK fertilizers and super phosphate. Fuelclassification solid, liquid and gaseous; nuclear fuel - examples and uses

CO5: have an idea about the pharmaceutical drugs analgesics and antipyretics likeparacetamol and aspirin and also about pigments and dyes and its applications.

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

CO-PSO Mapping (Course Articulation Matrix)

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Course Content

UNIT-I

General survey of chemicals used in everyday life. Air - components and their importance; photosynthetic reaction, air pollution, green - house effect and the impact on our life style. Water - Sources of water, qualities of potable water, soft and hard water, methods of removal of hardness-water pollution

UNIT-II

Building materials - cement, ceramics, glass and refractories - definition, composition and application only. Plastics - polythene, PVC, bakelite, polyesters, melamine-formaldehyde resins -preparation and uses only.

UNIT-III

Food and Nutrition - Carbohydrates, Proteins, Fats - definition and their importance as food constituents – balanced diet – Calories minerals and vitamins (sources and their physiological importance). Cosmetics – tooth paste, face powder, soaps and detergents, shampoos, nail polish, perfumes - general formulation and preparations - possible hazards of cosmetic use.

UNIT-IV

Chemicals in food production – fertilizers - need, natural sources; urea, NPK fertilizers and super phosphate. Fuel – classification - solid, liquid and gaseous; nuclear fuel examples and uses.

UNIT-V

Pharmaceutical drugs - analgesics and antipyretics - paracetamol and aspirin. Colour chemicals - pigments and dyes - examples and applications. Explosives - classification and examples.

Recommended Text

1. Food chemistry, H. K. Chopra, P. S. Panesar, Narosa publishing house, 2010.
2. A textbook of pharmaceutical chemistry by Jayashree Ghosh, S Chand publishing, 2012.
3. S. Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications, Karur, 2006.
4. B. K, Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014. Introduction to forensic chemistry, Kelly M. Elkins, CRC Press Taylor & Francis Group, 2019.
5. Jayashree Ghosh, Fundamental Concepts of Applied Chemistry, S. Chand & Co. Publishers, second edition, 2006.

ReferenceBooks

1. Randolph. Norris Shreve, Chemical Process Industries, McGraw-Hill,Texas, fourth edition, 1977.
2. W.A.Poucher, Joseph A. Brink, Jr.Perfumes, Cosmetics and Soaps, Springer,2000.
3. A.K.De, Environmental Chemistry, New Age International Public Co., 1990.

Part-IV B.Sc. Chemistry / Semester – I / FOUNDATION COURSE

(U23CHFC1)

Lecture Hours	**:**	**30**	**Tutorial Hours:**	**-**
Practical Hours	**:**	**-**	**No. of Credit**	**: 2**
Contact Hours per Semester		**: 45**		
Contact hours per Week		**: 02**		
Internal Marks	**: 50**			
External Marks	**:-**			
Total Marks	**: 50**			

Objectivesof the course

This course aims at providing an overall view of the

- Atom structure and electronic configuration
- Types of chemical bonding characters
- Different states of mater and their general properties
- Nomenclature of and isomerism in organic compounds
- Basic concepts of spectroscopy

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: learn about atom structure and periodic properties.

CO2: gain knowledge on types of chemical bonding

CO3: explain different states of matter

CO4: discussion on nomenclature and isomerism in organic compounds

CO5: knowledge on electromagnetic radiation and its interaction with matter

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	S	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	M	S	S	M	S	M
CO5	S	M	S	S	S	S	S	S	M	S

CO-PSO Mapping (Course Articulation Matrix)

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Course Content

UNIT-I

Structure of atom and periodic classification of Elements and properties

Atom structure-Fundamental particles-Atomic mass- Atomic number – Isotopes –Isobars – Isotones – Orbitals-Quantum number and their significance. Shapes of s,p and d orbitals- Rules governing electronic configuration in various its atomic orbitals.

Periodic table-periodic laws (Mendeleev and Mosley)- Classification of elements into s,p, d and f-blocks .Metals-Nonmetals-Periodic properties-Concept,Variation and factors affecting various periodic properties-Inert pair effect.

UNIT-II

Chemical Bonding

Definition- Types of chemical bond-Ionic bond- Ion polarization - Dipole moment and Percentage of ionic character-Covalent bond-Definition –Postulates of Valence bond theory and Concept of hybridization (sp, sp^2, sp^3, sp^3d, sp^3d^2, dsp^2, d^2sp^3) –Magnetic properties – Paramagnetic – Diamagnetic-Ferromagnetic. Co-ordinate covalent bond-Definition – Examples-Co-ordination compounds (basic concepts only).

UNIT III

Nomenclature and Isomerism in Organic compounds

Carbon compounds- Uniqueness of carbons- Classification of hydrocarbons - IUPAC Nomenclature of Organic compounds

Isomerism: Structural and Stereoisomerism

Structural Isomerism: Chain isomerism, Functional isomerism, Positional isomerism and Meta isomerism.

Stereoisomerism: Geometrical and Optical isomerism-Chiral molecule- Enantiomers-Diastereomers-Meso compounds-Racemic mixture.

UNIT IV

States of Matter

Gaseous state: Kinetic theory of gases- Ideal and Non-ideal gases- Ideal gas equation-Deviation of ideal gas from ideal behavior -vander Waal's equation and Liquification of gases.

Liquids :Intermolecularforces, Vapour pressure and Boiling point of liquid - Surface tension –Viscosity-Factors affecting surface tension and viscosity.

Solids: Definition - Characteristics of solids- Amorphous and Crystalline solids - Space lattice and unit cells - Close packed structure of solids-Radius ratio rule.

UNIT V

Introduction to Spectroscopy

Electromagnetic radiation- General characteristics of Wave – Wavelength – Frequency – Amplitude – Wave number - Electromagnetic spectrum- Absorption and Emission spectrum- Quantization of Energy level - Selection rule - Intensity of the Spectral lines –Width of Spectral lines. Types of spectroscopy: Microwave spectroscopy, Infrared spectroscopy, UV-Visible spectroscopy, Nuclear Magnetic Resonance spectroscopy, Electron spin resonance spectroscopy.

Reference books

1. R.D. Madan, Sathya Prakash, Mordern Inorganic chemistry 2nd edition, S.Chand and company, New Delhi, 2003.
2. B.S.Bhal, Arun Bhal, Advanced Organic chemistry, 3rd edition, S.Chand and company, New Delhi, 2003.
3. U.N.Dash, O.P.Dharmarha, P.L.Soni, Textbook of Physical Chemistry, Sultan Chand & sons, New Delhi, 2016.

4. Y.R.Sharma Organic spectroscopy Principles and Chemical applications, S.Chand&Company PVT Ltd ,2002.
5. C.N.Banwell, Fundamentals of spectroscopy Tata McGraw Hill, 1983.

Website and e-learning

Source: https://onlinecourses.nptel.ac.inhttp://cactus.dixie.edu/smblack/chem1010/lec

Part-III B.Sc. Chemistry / Semester – II / Core-II: GENERAL CHEMISTRY-II (U23CH202)

Lecture Hours	**:**	**60**		**Tutorial Hours**	**: 15**
Practical Hours	**:**	**-**		**No. of Credit**	**: 5**
Contact Hours per Semester			**: 75**		
Contact hours per Week			**: 05**		
Internal Marks	**:**	**25**			
External Marks	**:**	**75**			
Total Marks	**:**	**100**			

Objectivesof the course

This course aims at providing an overall view of the

- chemistry of acids, bases and ionic equilibrium
- properties of s and p-block elements
- chemistry of hydrocarbons
- applications of acids and bases
- Compounds of main block elements and hydrocarbons

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: explain the concept of acids, bases and ionic equilibria; periodic properties of s and pblock elements, preparation and properties of aliphatic and aromatic hydrocarbons

CO2: discuss the periodic properties of sand p- block elements, reactions of aliphatic and aromatic hydrocarbons and strength of acids

CO3: classify hydrocarbons, types of reactions, acids and bases, examine the properties s and p-block elements, reaction mechanisms of aliphatic and aromatic hydrocarbons

CO4: explain theories of acids, bases and indicators, buffer action and important compoundsof s-block elements

CO5: assess the application of hard and soft acids indicators, buffers, compounds of s and p- block elements and hydrocarbons

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

CO-PSO Mapping (Course Articulation Matrix)

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Course Content

UNIT-I

Acids, bases and Ionic equilibria (L-12Hrs; T-3Hrs)

Concepts of Acids and Bases - Arrhenius concept, Bronsted-Lowry concept, Lewis concept; Relative strengths of acids, bases and dissociation constant; dissociation of poly basic acids, ionic product of water, pH scale, pH of solutions; Degree of dissociation, common ion effect, factors affecting degree of dissociation; acid base indicators, theory of acid base indicators – action of phenolphthalein and methyl orange, titration curves - use of acid base indicators;

Buffer solutions – types, mechanism of buffer action in acid and basic buffer, Henderson-Hasselbalch equation;

Salt hydrolysis - salts of weak acids and strong bases, weak bases and strong acids, weak acids and weak bases - hydrolysis constant, degree of hydrolysis and relation between hydrolysis constant and degree

of hydrolysis;

Solubility product - determination and applications; numerical problems involving the core concepts

UNIT-II

Chemistry of s - Block Elements (L-12Hrs; T-3Hrs)

Hydrogen: Position of hydrogen in the periodic table. Alkali metals: Comparative study of the elements with respect to oxides, hydroxides, halides, carbonates and bicarbonates. Diagonal relationship of Li with Mg. Preparation, properties and uses of NaOH, Na_2CO_3, KBr, $KClO_3$ alkaline earth metals. Anomalous behaviour of Be.

Chemistry of p- Block Elements (Group 13 & 14)

Preparation and structure of diborane and borazine. Chemistry of borax. Extraction of Al and its uses. Alloys of Al. comparison of carbon with silicon. Carbon-di-sulphide – Preparation, properties, structure and uses. Percarbonates, per monocarbonates and per dicarbonates.

UNIT-III

Chemistry of p- Block Elements (Group 15-18) (L-12Hrs; T-3Hrs)

General characteristics of elements of Group 15; chemistry of $H_2N\text{-}NH_2$, NH_2OH, HN_3 and HNO_3. Chemistry of PH_3, PCl_3, PCl_5, $POCl_3$, P_2O_5 and oxy acids of phosphorous (H_3PO_3 and H_3PO_4).

General properties of elements of group16 - Structure and allotropy of elements - chemistry of ozone - Classification and properties of oxides - oxides of sulphur and selenium – Oxy acids of sulphur (Caro's and Marshall's acids).

Chemistry of Halogens: General characteristics of halogen with reference to electro-negativity, electron affinity, oxidation states and oxidizing power. Peculiarities of fluorine. Halogen acids (HF, HCl, HBr and HI), oxides and oxy acids ($HClO_4$). Inter-halogen compounds (ICl, ClF_3, BrF_5 and IF_7), pseudo halogens [$(CN)_2$ and $(SCN)_2$] and basic nature of Iodine.

Noble gases: Position in the periodic table. Preparation, properties and structure of XeF_2, XeF_4, XeF_6 and $XeOF_4$; uses of noble gases - clathrate compounds.

UNIT-IV

Hydrocarbon Chemistry-I (L-12Hrs; T-3Hrs)

Petro products: Fractional distillation of petroleum; cracking, isomerisation, alkylation, reforming and uses

Alkenes: Nomenclature, general methods of preparation – Mechanism of □- elimination reactions – E1 and E2 mechanism - factors influencing – stereochemistry – orientation – Hofmann and Saytzeff rules.

Reactions of alkenes – addition reactions – mechanisms – Markownikoff's rule, Kharasch effect, oxidation reactions – hydroxylation, oxidative degradation, epoxidation, ozonolysis; polymerization.

Alkadienes: Nomenclature - classification – isolated, conjugated and cumulated dienes; stability of conjugated dienes; mechanism of electrophilic addition to conjugated dienes - 1, 2 and 1, 4 additions; free radical addition to conjugated dienes– Diels–Alder reactions – polymerisation – polybutadiene, polyisoprene (natural rubber), vulcanisation, polychloroprene.

Alkynes: Nomenclature; general methods of preparation, properties and reactions; acidic nature of terminal alkynes and acetylene, polymerisation and isomerisation.

Cycloalkanes: Nomenclature, Relative stability of cycloalkanes, Bayer's strain theory and its limitations. Conformational analysis of cyclohexane, mono and di substituted cyclohexanes. Geometrical isomerism in cyclohexanes.

UNIT-V

Hydrocarbon Chemistry – II (L-12Hrs; T-3Hrs)

Benzene: Source, structure of benzene, stability of benzene ring, molecular orbital picture of benzene, aromaticity, Huckel's (4n+2) rule and its applications. Electrophilic substitution reactions - General mechanism of aromatic electrophilic substitution - nitration, sulphonation, halogenation, Friedel-Craft's alkylation and acylation. Mono substituted and disubstituted benzene - Effect of substituent – orientation and reactivity.

Polynuclear Aromatic hydrocarbons: Naphthalene – nomenclature, Haworth synthesis; physical properties, reactions – electrophilic substitution reaction, nitration, sulphonation, halogenation, Friedel – Crafts acylation & alkylation, preferential substitution at □ - position – reduction, oxidation – uses.

Anthracene – synthesis by Elbs reaction, Diels – Alder reaction and Haworth synthesis; physical properties; reactions - Diels-Alder reaction, preferential substitution at C-9 and C-10; uses.

Questions related to the above topics, from various competitive examinations UPSC/JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)

RecommendedText

1. Madan R D, Sathya Prakash, (2003), Modern Inorganic Chemistry, 2nd ed, S.Chand and Company, New Delhi.
2. Sathya Prakash, Tuli G D,Basu S K and Madan R D, (2003), Advanced Inorganic Chemistry, 17th ed., S.Chand and Company, New Delhi.

3. Bahl B S, Arul Bhal, (2003), Advanced Organic Chemistry, 3rd ed., S.Chand and Company, New Delhi.
4. Tewari K S, Mehrothra S N and Vishnoi N K, (1998), Text book of Organic Chemistry, 2nd ed., Vikas Publishing House, New Delhi.
5. Puri B R, Sharma L R, (2002), Principles of Physical Chemistry, 38th ed., Vishal Publishing Company, Jalandhar.

ReferenceBooks:

1. Maron S H and Prutton C P, (1972), Principles of Physical Chemistry, 4thed., The Macmillan Company, Newyork.
2. Barrow G M, (1992), Physical Chemistry, 5th ed., Tata McGraw Hill, NewDelhi.
3. Lee J D, (1991), Concise Inorganic Chemistry, 4thed., ELBS WilliamHeinemann, London.
4. Huheey J E, (1993), Inorganic Chemistry: Principles of Structure andReactivity, 4th ed., Addison Wesley Publishing Company, India.
5. Gurudeep Raj, (2001), Advanced Inorganic Chemistry Vol – I, 26th ed.,Goel Publishing House, Meerut.
6. Agarwal O P, (1995), Reactions and Reagents in Organic Chemistry, 8thed., Goel Publishing House,Meerut.

Website and e-learning source:

https://onlinecourses.nptel.ac.in http://cactus.dixie.edu/smblack/chem1010/lecture_notes/4B.html http://www.auburn.edu/~deruija/pdareson.pdf https://swayam.gov.in/course/64-atomic-structure-and-chemical-bonding

MOOC components - http://nptel.ac.in/courses/104101090/

Lecture 1: Classification of elements and periodic properties http://nptel.ac.in/courses/104101090/

Part-III B.Sc. Chemistry / Semester – II / Core Practical-II: QUALITATIVE ORGANIC ANALYSIS AND PREPARATION OF ORGANIC COMPOUNDS (U23CH2P2)

Lecture Hours	**:**	**-**	**Tutorial Hours**	**: -**
Practical Hours	**:**	**45**	**No. of Credit**	**: 3**
Contact Hours per Semester		**: 45**		
Contact hours per Week		**: 03**		
Internal Marks	**:40**			
External Marks	**:60**			
Total Marks	**: 100**			

Objectivesof the course

This course aims at providing knowledge on

- Laboratory safety
- Handling glass wares
- Analysis of organic compounds
- Preparation of organic compounds

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: observe the physical state, odour, colour and solubility of the given organic compound.

CO2: identify the presence of special elements and functional group in an unknown organic compound performing a systematic analysis.

CO3: compare mono and dicarboxylic acids, primary, secondary and tertiary amines, mono and diamides, mono and polyhydric phenols, aldehyde and ketone, reducing and non- reducing sugars and explain the reactions behind it.

CO4: exhibit a solid derivative with respect to the identified functional group.

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M

CO-PSO Mapping (Course Articulation Matrix)

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
Weightage	12	12	12	12	12
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Course Content

UNIT I

Safety rules, symbols and first-aid in chemistry laboratory

Basic ideas about Bunsen burner, its operation and parts of the flame.Chemistry laboratory glassware –basis information and uses.

UNIT II

Qualitative Organic Analysis

Preliminary examination, detection of special elements - nitrogen, sulphur andhalogens

Aromatic and aliphatic nature, Test for saturation and unsaturation,identification of functional groups using solubility tests, Confirmation of functional groups

- Monocarboxylic acid, dicarboxylic acid
- Monohydric phenol, polyhydric phenol
- Aldehyde, ketone, ester
- Carbohydrate (reducing and non-reducing sugars)
- Primary, secondary, tertiary amine
- Monoamide, diamide, thioamide
- Anilide, nitro compound

Preparation of derivatives for functional groups

UNIT III

Preparation of Organic Compounds

- Nitration - picric acid from Phenol
- Halogenation - p-bromo acetanilide from acetanilide
- Oxidation - benzoic acid from Benzaldehyde
- Microwave assisted reactions in water
- Methyl benzoate to Benzoic acid
- Salicylic acid from Methyl Salicylate
- Rearrangement - Benzil to Benzilic Acid
- Hydrolysis of benzamide to Benzoic Acid

Separation and Purification Techniques (Not for Examination)

- Purification of organic compounds by crystallization (from water / alcohol)and distillation
- Determination of melting and boiling points of organic compounds.
- **Steam distillation** - Extraction of essential oil from citrus fruits/eucalyptusleaves.

1. Chromatography (any one) (Group experiment)

- Separation of amino acids by Paper Chromatography
- Thin Layer Chromatography-mixture of sugars/plant pigments/permanganate dichromate.
- Column Chromatography - extraction of carotene, chlorophyll and xanthophyll from leaves / separation of anthracene - anthracene picrate.

2. Electrophoresis – Separation of amino acids and proteins. **(Demonstration)**

- Isolation of casein from milk
- Determination of saponification value of oil orfat
- Estimation of acetic acid from commercial vinegar. (Any one Group experiment) (4,5& 6–not for ESE).

ReferenceBooks

1. Venkateswaran, V.; Veeraswamy, R.; Kulandaivelu, A.R. *Basic Principles of Practical Chemistry*, 2nd ed.; Sultan Chand: New Delhi, 2012.
2. Manna, A.K. *Practical Organic Chemistry*, Books and Allied: India,2018.
3. Gurtu, J. N; Kapoor, R. *Advanced Experimental Chemistry (Organic)*,Sultan Chand: New Delhi, 1987.
4. Furniss,B. S.; Hannaford, A. J.; Smith, P. W. G.; Tatchell, A.R. *Vogel'sTextbook of Practical Organic Chemistry*, 5th ed.; Pearson: India,1989.

Website ande-learning source

https://www.vlab.co.in/broad-area-chemical-sciences

Part-III B.Sc. Chemistry / Semester – II / Skill Enhancement Course -II (Non Major Elective): DAIRY CHEMISTRY (U23CH2S2)

Lecture Hours	**: 30**	**Tutorial Hours**	**: -**
Practical Hours	**: -**	**No. of Credit**	**: 02**
Contact Hours per Semester	**: 30**		
Contact hours per Week	**: 02**		
Internal Marks	**: 50**		
External Marks	**: -**		
Total Marks	**: 50**		

Objectives of the course

This course aims at providing an overall view of the

Chemistry of milk and milk products

Processing of milk

Preservation and formation of milk products

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO 1: understand about general composition of milk – constituents and its physical properties.

CO 2: acquire knowledge about pasteurization of Milk and various types of pasteurization - Bottle, Batch and HTST Ultra High Temperature Pasteurization.

CO 3: learn about Cream and Butter their composition and how to estimate fat in cream and ghee

CO 4: explain about Homogenized milk, flavoured milk, vitaminised milk and toned milk.

CO 5: have an idea about how to make milk powder and its drying process - types of dry in process.

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

CO-PSO Mapping (Course Articulation Matrix)

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Course Content

UNIT I

Composition of Milk

Milk-definition-general composition of milk- constituents of milk - lipids, proteins, carbohydrates, vitamins and minerals - physical properties of milk - colour, odour, acidity, specific gravity, viscosity and conductivity -Factors affecting the composition of milk - adulterants, preservatives with neutralizer-examples and their detection- estimation of fat, acidity and total solids in milk.

UNIT II

Processing of Milk

Microbiology of milk - destruction of micro - organisms in milk, physico – chemical changes taking place in milk due to processing - boiling, pasteurization – types of pasteurization -Bottle, Batch and HTST (High Temperature Short Time) – Vacuum pasteurization – Ultra High Temperature Pasteurization.

UNIT III

Major Milk Products

Cream - definition - composition - chemistry of creaming process - gravitational and centrifugal methods of separation of cream - estimation of fatin cream. Butter - definition -composition - theory of churning – desi butter - salted butter, estimation of acidity and moisture content in butter. Ghee - major constituents - common adulterants added to ghee and their detection - rancidity- definition - prevention - antioxidants and synergists - natural and synthetic.

UNIT IV

Special Milk

Standardised milk - definition - merits - reconstituted milk - definition - flowdiagram of manufacture - Homogenised milk - flavoured milk – vitaminised milk - toned milk -Incitation milk - Vegetable toned milk - humanized milk - condensed milk - definition, composition and nutritive value.

UNIT V

Fermented and other Milk Products

Fermented milk products – fermentation of milk - definition, conditions,cultured milk - definition of culture - example, conditions - cultured cream,butter milk - Bulgarious milk -acidophilous milk – Yoheer Indigeneous products- khoa and chhena definition - Ice cream -definition-ercentage composition-types-ingredients-manufacture of ice–cream, stabilizers- emulsifiers and their role-milk powder-definition-need form a king milk powder- drying process-types of drying.

RecommendedText

1. K. Bagavathi Sundari, Applied Chemistry, MJP Publishers, first edition,2006.
2. K. S. Rangappa and K.T. Acharya, Indian Dairy Products, Asia PublishingHouse New Delhi, 1974.
3. Text book of dairy chemistry, M.P. Mathur, D. Datta Roy, P. Dinakar, IndianCouncil of Agricultural Research, 1 st edition, 2008.
4. A Text book of dairy chemistry, Saurav Singh, Daya Publishing house, 1 stedition,2013.
5. Text book of dairy chemistry, P. L. Choudhary, Bio-Green book publishers,2021.

ReferenceBooks

1. Robert Jenness and S. Patom, Principles of Dairy Chemistry, S.Wiley, NewYork, 2005.
2. F.P.Wond, Fundamentals of Dairy Chemistry, Springer, Singapore,2006.
3. Sukumar De, Outlines of Dairy Technology, Oxford University Press, NewDelhi, 1980.
4. P.F.Fox and P.L.H. Mcsweeney, Dairy Chemistry and Biochemistry,Springer, Second edition, 2016.
5. Dairy chemistry and biochemistry, P. F. Fox, T. Uniacke-Lowe, P.L.H.
6. McSweeney, J.A. OMahony, Springer, Second edition, 2015.

Part-III B.Sc. Chemistry / Semester – II / Skill Enhancement Course -III

(Non Major Elective): COSMETICS AND PERSONAL GROOMING

Lecture Hours	**: 30**	**Tutorial Hours: -**	
Practical Hours	**: -**	**No. of Credit**	**: 02**
Contact Hours per Semester	**: 30**		
Contact hours per Week	**: 02**		
Internal Marks	**: -**		
External Marks	**: 50**		
Total Marks	**: 50**		

Objectivesof the course

This course aims at familiarizing the students with

- Formulations of various types of cosmetics and their significance
- Hair, skin and dental care
- Makeup preparations and personal grooming

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

CO1: know about the composition of various cosmetic products

CO2: understand chemical aspects and applications of hair care and dental care and skin care products.

CO3: understand chemical aspects and applications of perfumes and skin care products.

CO4: to understand the methods of beauty treatments their advantages and disadvantage

CO5: understand the hazards of cosmetic products.

CO-PO Mapping (Course Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	S	S	S	M	M	S

CO-PSO Mapping (Course Articulation Matrix)

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Course Content

Unit I Skin care

Nutrition of the skin, skin care and cleansing of the skin; face powder – ingredients; creams and lotions – cleansing, moisturizing all purpose, shavingand sunscreen (formulation only); Gels – formulation and advantages; astringent and skin tonics – key ingredients, skin lightness, depilatories.

Unit II Hair care

Shampoos – types – powder, cream, liquid, gel – ingredients; conditioner –types – ingredients

Dental care

Tooth pastes – ingredients – mouth wash

Unit III Make up

Base – foundation – types – ingredients; lipstick, eyeliner, mascara, eyeshadow, concealers, rouge

Unit IV Perfumes

Classification - Natural – plant origin – parts of the plant used, chief constituents; animal origin – amber gries from whale, civetone from civet cat, musk from musk deer; synthetic – classification emphasizing characteristics –esters – alcohols – aldehydes – ketones

Unit V Beauty treatments

Facials - types – advantages – disadvantages; face masks – types; bleach -types – advantages– disadvantages; shaping the brows; eyelash tinting; perming-types; hair colouring and dyeing ; permanent waving – hair straightening; wax types – waxing; pedicure, manicure - advantages – disadvantages.

Recommended Text

1. Thankamma Jacob, (1997) Foods, drugs and cometics – A consumer guide, Macmillan publication, London.

ReferenceBooks

1. Wilkinson J B E and Moore R J, (1997) Harry's cosmeticology, 7^{th} ed., Chemical Publishers, London.
2. George Howard, (1987) Principles and practiceof perfumes and cosmetics, Stanley Therones, Chettenham.

Website ande-learning source

1. http://www.khake.com/page75.html
2. Net.foxsm/list/284

CHEMISTRY IN DAY TO DAY LIFE

(To be completed before VIth Semester)

Lecture Hours	**: -**	**Tutorial Hours**	**: -**
Practical Hours	**: -**	**No. of Credit**	**: 03**
Contact Hours per Semester : -			
Contact hours per Week	**: (Self study course)**		
Internal Marks	**: -**		
External Marks	**: 100**		
Total Marks	**: 100**		

Objectivesof the course

This course aims at familiarizing the students with

- The applications of Chemistry in everyday life
- The food we eat, the water we drink, the clothes we wear, the medicines we are prescribed
- The products we use in our daily life such as soaps, detergents, cosmetics, perfumes etc.

Course Outcomes (COs)

On successful completion of the Course, the learners will be able to

S. No.	Course Outcome	Knowledge Level (RBT)
CO1	recall the simple methods to identify the adulteration of milk, food, oils, honey, therapeutic uses of the chemicals used in pharmacy, composition and classification of soaps and detergents and their environmental hazards, composition and toxicology of cosmetics and types and uses of plastics	K1
CO2	understand the basic Chemistry behind the utility products and their uses in daily life	K2
CO3	classify soaps and detergents, creams and polymers, illustrate simple methods to find adulteration of milk, food, oils and honey, illustrate the uses and toxicology of food additives, cosmetics and environmental hazards of plastics	K3
CO4	identify and describe International Universal recycling codes and symbols and identify the uses of utility chemicals used in day to day life	K4

CO5	discuss the toxicology of food additives , food poisoning and its prevention, methods of food preservation, therapeutic uses of the chemicals used in pharmacy, manufacture of soaps and detergents, composition, classification and toxicology of cosme tics, Environmental Hazards of plastics	K5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create.

CO-PO Mapping (Course Articulation Matrix)

POs / Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	2	1	1	1	2	2
CO2	2	2	1	1	1	2	2
CO3	2	2	1	1	1	2	2
CO4	2	2	1	2	1	2	2
CO5	2	2	1	1	1	2	2
Total Contribution of COs to Pos	**10**	**10**	**5**	**6**	**5**	**10**	**10**
Weighted Percentage of COs Contribution to Pos	**66.6**	**66.6**	**33.3**	**40**	**33.3**	**66.6**	**66.6**

1- low, 2-moderate 3-high 0-no correlation

Course content

Chemistry in day to day life

Unit I- Adulteration of food

Simple methods to find adulteration of milk, food, oils (edible and mineral) and honey- food laws- food poisoning and its prevention - Food preservation- Food colours - permitted and non- permitted – Toxicology. Flavours – natural and synthetic – Toxicology – Sweetening agents- Toxicology of other functional additives.

Unit II- Chemicals in Pharmacy

Definition, examples and therapeutic uses of the following (an elementary study only) - Antiseptics, Mouth washes, Antibiotics,Antacids, Analgesics, Antipyretics, Antimalarials, Anaesthetics, Haematinics, Laxatives, Sedatives, Cardiovascular drugs, Neoplastic drugs, Hypoglycemic drugs, Anti-convulsant drugs and Sulphonamides

Unit III- Soaps and Detergents

Soaps – Basic chemical composition of soaps- classification of soaps-manufacture of soap by continuous process- Toilet soap, bathing bars, washing soaps, liquid soap manufacture – Batch process, cold process, hot process.

Detergents-Introduction- types of detergents – Detergent action- Common detergent chemicals. Enzymes used in commercial detergents- Environmental Hazards

Unit IV- Cosmetics

Basic concept– composition and classification of creams- face creams, sun screen and sun tan lotions, deodorants, talcum powder, skin care products, dental cosmetics, hair dyes, shaving cream, shampoo, lipsticks. General formation for each type - Toxicology of cosmetics.

Unit V- Plastics in daily use:

Introduction to polymers–types of polymers- thermoplastics and thermosetting plastics - advantages of plastics - uses of LDPE, HDPE, PP, PS, PET, Bakelite and melamine- Recycling of plastics- International Universal recycling codes and symbols for identification. Environmental Hazards of plastics-Biodegradable plastics.

References

1. T.P. Coultate, Food – The Chemistry of its components. Royal Society of Chemistry London, (paperback)
2. Shashi Chowls, Engineering Chemistry, Darpat Rai Publication.
3. B.K. Sharma, Industrial Chemistry.
4. CNR Rao, Understanding Chemistry, Universities Press.

Part-V B.Sc. Chemistry/ Semester I - VI / Proficiency Enhancement Course (Self Study Course): GENERAL STUDIES

Lecture Hours	**: -**	**Tutorial Hours**	**: -**
Practical Hours	**: -**	**No. of Credit**	**: 02**
Contact Hours per Semester : -			
Contact hours per Week	**: (Self study course)**		
Internal Marks	**: -**		
External Marks	**: 100**		
Total Marks	**: 100**		

Course Content

General Studies

UNIT-I: General Science

i) General Scientific Laws – Mechanics - Properties of Matter, Force, Motion and Energy –Electricity and Magnetism, Light, Sound, Heat, Nuclear Physics, Electronics and Communications, solar energy

ii) Atomic structure, Elements and Compounds, Acids, Bases, Salts, Petroleum Products, Fertilisers, Pesticides, Energy resources

iii) Classification of Living Organisms, Evolution, Genetics, Physiology, Nutrition, Health and Hygiene, Diseases

iv) Environment and Ecology- Biosphere, Conservation of biodiversity- Biosphere Reserves of India, Sanctuaries and National parks, Environmental pollution, causes and control measures, alternate sources of energy

UNIT-II: General knowledge, Current Events, Quantitative Aptitude and Mental Ability

i) Latest Diary of Events - National symbols - Profile of States and Union territories Eminent persons and places in news – Sports - Books and Authors- Prominent Personalities in various spheres – Arts, Science, Literature and awards.

ii) Political parties and Political system in India – Public awareness and general administration - Welfare oriented Government Schemes and their utility, Problems in Public Delivery Systems. Public Corruption and Lokpal & Lokayuktha act

iii) Geographical landmarks - Current socio - economic issues - Latest inventions in Science and Technology. Industrial growth in India and Tamilnadu

iv) Quantitative Aptitude and Mental Ability- Simplification – Percentage - Ratio and Proportion- Time and Work - Simple interest - Compound interest - Area - Volume – Logical Reasoning -Visual Reasoning – Alpha numeric Reasoning – Number Series

UNIT-III: Geography of India & Tamil Nadu

(i) Location – Physical features - Monsoon, Rainfall, Weather and Climate - Water Resources-Rivers in India - Soil, Minerals and Natural Resources - Forest and Wildlife – Agricultural pattern

(ii) Transport – Communication

(iii) Social Geography –Population, Census, poverty eradication and unemployment

(iv) Natural calamity – Disaster Management – Environmental pollution Climate change, pandemics in history – Green energy initiatives

UNIT–IV: History and Culture of India & Tamil Nadu

i) Ancient India**:** Indus Valley Civilization - The Maurian empire- Age of the Guptas vardhana empire- Nalanda University

ii) Medieval India : The Delhi Sultanate, Mughals and Marathas - Age of Vijayanagara and Bahmani Kingdoms –South Indian History.

iii) National Renaissance : Early uprising against British rule – sepoy mutiny Indian National Congress - Emergence of leaders- Gandhian Era

iv) Tamil Nadu : History & Culture, Socio-Political Movements

UNIT-V: Indian Polity, Economy and Tamil Nadu Administration

i) Constitution of India - Preamble to the Constitution –Salient features of the Constitution - Citizenship, Fundamental Rights, Fundamental Duties, and Directive Principles of State Policy

ii) Union Executive, Union Legislature (Parliament) – State Executive, State Legislature – Local Governments, Panchayat Raj- Spirit of Federalism - Centre - State Relationships- Election – Judiciary in India – Rule of Law

iii) Indian Economy – Five-year plan models – an assessment – Planning Commission and Niti Ayog - Reserve Bank of India – Fiscal Policy and Monetary Policy – Finance Commission –Goods and Services Tax

iv) Governance in India and Development-Administration in Tamil Nadu

Text Books:

1. TNSCERT Books (Science and Social) from Std VI -X

2. Manorama year Book (Tamil)

3. Arihant General Knowledge, 2022-Manohar Pandey