



VIRUDHUNAGAR HINDU NADARS' SENTHIKUMARA NADAR COLLEGE
(An Autonomous Institution Affiliated to Madurai Kamaraj University)
Virudhunagar – 626 001.

Program Name: Bachelor of Science
Discipline : Chemistry
(For those who Join in 2022 and after)

III year B.Sc. CHEMISTRY

Semester	Part	Subject Name	Hours	Credit	Int + Ext = Total	Local	Regional	National	Global	Professional Ethics	Gender	Human Values	Environment & Sustainability	Employability	Entrepreneurship	Skill Development	Subject Code	Revised / New / No Change / Interchanged & Percentage of Revision
V	Core V	Organic Chemistry I	4	4	25+75=100			✓						✓			U3CHC51/ U24CHC51	No Change
	Core VI	Physical Chemistry I	4	4	25+75=100			✓						✓			U3CHC52/ U24CHC52	No Change
	Core VII	Inorganic Chemistry I	4	4	25+75=100			✓						✓			U24CHC53	40% Revised
	Core III Lab	LAB: Organic Preparations and Gravimetric Estimations	3	-	---			✓								✓	---	No Change
	Core IV Lab	LAB: Organic Analysis and Organic Estimations	3	-	---			✓								✓	---	No Change
	Core V Lab	LAB: Physical Chemistry experiments	2	-	---			✓								✓	---	No Change
	Allied	Physics - Electricity & Electronics	4	4	25+75=100												U1PHA5X3/ U24PHAY51	No Change
	Allied	LAB – Physics Practical - II	2	-	---												---	
	SBS V	Employability Skills	2	1	25+75=100											✓	U24PS51	Revised 50%
	NME I	Chemistry in day-to-day life	2	2	25+75=100			✓						✓			U24CHN51	10% Change
Total			30	19														
Internship Programme			60	2													U24IP51	New



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VI	Core VIII	Organic Chemistry II	4	4	25+75=100			✓					✓			U24CHC61	10% Revised
	Core IX	Physical Chemistry II	4	4	25+75=100			✓					✓			U3CHC62/ U24CHC62	No Change
	Core X	Inorganic Chemistry-II	4	4	25+75=100			✓					✓			U24CHC63	20% Revised
	Core III Lab	LAB: Organic Preparations and Gravimetric Estimations	3	3	40+60=100			✓						✓		U24CHCP61	Credit Change
	Core IV Lab	LAB: Organic Analysis and Organic Estimations	3	3	40+60=100			✓						✓		U24CHCP62	Credit Change
	Core V Lab	LAB: Physical Chemistry Experiments	2	4	40+60=100			✓						✓		U2CHC6P3/ U24CHCP63	No Change
	Allied	Physics – Optics & Photonics	4	4	25+75=100											U24PHAY61	Revised 25%
	Allied LAB	LAB – Physics Practical - II	2	2	40+60=100											U2PHA6PX/ U24PHAYP61	No Change
	SBS	Project	2	2	50+50=100			✓						✓	✓	U1CH6PR/ U24CH6PR	No Change
	NME II	Industrial Chemistry	2	2	25+75=100			✓						✓		U24CHN61	80 % Revised
		Total	30	32													

Self-Learning Course:

Year	Semester	SELF LEARNING COURSE Subject	Credit	Ext= TOT	Subject Code	Focus on Employability/ Entrepreneurship/ Skill Development	Revised/ New/ No Change/ Interchanged If Revised % of Change
III	V	COSMETICS	5	100=100	U1CHSL51	Entrepreneurship	No Change
III	V	CHEMISTRY COMPETITIVE SKILL DEVELOPMENT COURSE	5	100=100	U1CHSL52	Skill Development	No Change



SEMESTER-V
ORGANIC CHEMISTRY I

Hours per week: 4

Credits: 4

Subject Code: U3CHC51/U24CHC51

Course Outcomes:

Students after Successful completion of the course will be able:

CO1: To gain knowledge on polynuclear hydrocarbons and green chemistry.

CO2: To learn the synthesis of new compounds and their properties.

CO3: To understand the concept of nomenclature, preparation and uses of aromatic carbonyl compounds and to analyse the mechanism of a few name reactions

CO4: To know the concept of nomenclature, preparation and uses of aromatic carboxylic acids and substituted carboxylic acids

CO5: To impart the knowledge of preparation, properties and uses of active methylene compounds and organometallic compounds

Unit I: Polynuclear aromatic hydrocarbons and Green chemistry **12 Hours**

Isolated system- preparation, properties and uses of biphenyl, triphenylmethane and stilbene. Condensed ring system: synthesis, properties and the structure of naphthalene, anthracene and phenanthrene - preparation, properties and uses of naphthylamines, naphthols, naphthaquinones and alizarin- structural elucidation of alizarin. Green Chemistry- Twelve principles of Green Chemistry- Green solvents.

Unit II: Derivatives of benzene **12 Hours**

Halobenzenes: Theory of orientation and reactivity - general preparation – properties - uses. Electrophilic and nucleophilic aromatic substitution reactions (Benzyne mechanism) - mechanisms.

Hydroxybenzene: Acidic character of phenols - effect of substituents on acidity of phenols - mechanism of Reimer -Tiemann reaction, Kolbe reaction- preparation of cresols, catechol, resorcinol, quinol and eugenol.

Aromatic nitro compounds: Preparation and properties of nitrotoluenes - reduction in different medium.

Aromatic amino compounds: - preparations - effect of substituents on the basic character of aromatic amines - comparison between aliphatic and aromatic amines.

Unit III: Aromatic carbonyl compounds **12 Hours**

Aldehydes and ketones: Nomenclature - structure of carbonyl compounds - General method of preparation and properties of aldehydes and ketones. Preparation, properties and uses of cinnamaldehyde – coumarin - vanillin, Michler's ketone, benzoquinones, Quinone's - nitroso oxime tautomerism. Phenolic ketones- phloroacetophenone - Houben-Hoesch synthesis.

Mechanism of Perkin's reaction, Claisen reaction, Cannizzaro reaction, Knoevenagel reaction, Benzoin condensation and Gattermann aldehyde synthesis.

Unit IV: Aromatic carboxylic acids **12 Hours**

Aromatic carboxylic acids - Nomenclature - structure of carboxylic acid - General methods of preparation and properties of carboxylic acids - effect of substituents on acidic character. Preparation, properties and uses of phenylacetic acid, mandelic acid, cinnamic acid, phthalic acid, isophthalic acid and terephthalic acid.



Substituted acids - preparation, properties and uses of salicylic acid, aspirin, anthranilic acid.
Aromatic sulphonic acids: preparation and uses of benzene sulphonic acid, saccharin, chloramine-T and dichloramine-T.

Unit V: Organic synthesis

12 Hours

Active methylene compounds: Introduction - Preparation, properties and synthetic applications of active methylene compounds such as acetoacetic ester and dimethylmalonate.
Organometallic compounds: Introduction. Preparation, properties and synthetic applications of - Grignard reagent.
Preparation and synthetic applications of benzene diazonium chloride.

References:

Units I to V

1. I.L. Finar, Organic Chemistry Vol.I ELBS, 6th edition, 1973.
2. R.T. Morrison and R.W. Boyd, Organic Chemistry, Prantice Hall of India private Ltd, 6 th edition, 2001.
3. P.L.Soni, Organic Chemistry, Sultan Chand & Sons, New Delhi, 29th edition, 2007.
- 4 B.S.Bahl and Arun Bahl, Advanced Organic Chemistry, S.Chand & Company Ltd., Ram Nagar, New Delhi, 14th edition, 1996.
- 5.M.K. Jain and S.C. Sharma, Modern Organic Chemistry, Vishal Publishing Co, Jalandhar-Delhi, 4th edition, 2013.
6. V. Kumar An Introduction to Green Chemistry, Vishal Publishing Company, Delhi.
7. K. S. Tewari and N. K. Vishoni, A textbook of organic chemistry, III Edition, Vikas Publishing House, New Delhi, 2006.

Physical Chemistry I

Hours per week: 5

Credits: 5

Subject Code: U3CHC52/ U24CHC52

Course Outcomes:

CO1: To know basic concepts of thermodynamics and its applications to simple systems

CO2: To find the various criteria and their limitations for reversible and irreversible processes in thermodynamics.

CO3: To understand the basic concepts of electrochemistry and its applications

CO4: To acquire the basic knowledge on chemical kinetics and able to apply the principles for the study of simple reactions.

CO4: To impart the skill of applying the principles of chemical and ionic equilibria to solve simple problems.

Unit I: Thermodynamics I

12 Hours

Terms used in thermodynamics - thermodynamic processes- work, energy and heat- First Law – statement – mathematical formulation – internal energy – enthalpy or heat content – heat capacity at constant volume (C_v) and at constant pressure (C_p) – relationship between C_p and C_v – work done, heat change and enthalpy change for reversible isothermal expansion and compression of an ideal gas – calculation of q , w , ΔE and ΔH for reversible adiabatic expansion of an ideal gas – relation between T , V and P of an ideal gas undergoing adiabatic reversible expansion – application of first law to non ideal gas undergoing reversible isothermal and adiabatic expansion – Joule Thomson effect – Joule Thomson coefficient in the case of ideal and real gases – inversion temperature and its physical significance.



Unit II: Thermodynamics II

12 Hours

Limitations of first law of thermodynamics – spontaneous process – various statements of second law – conversion of heat into work – thermodynamic efficiency – Carnot cycle – refrigeration cycle – Carnot theorem – Kelvin scale of temperature.

Concept of entropy – physical significance of entropy – derivation of the concept of entropy – Helmholtz work function – Gibbs free energy – variation of free energy with temperature and pressure - Maxwell's relations- Thermodynamic equation of states- Criteria for reversible and irreversible processes in terms of ΔS , ΔG , ΔH and ΔA – limitations of these criteria- Gibbs-Helmholtz equation and its applications.

Unit III: Basics of Electrochemistry I

12 Hours

Electrolytic conduction- Faraday's law of electrolysis- conductivities of ions- specific, equivalent and molar conductance- measurement of conductance of electrolytes- variation of conductance with dilution- equivalent conductance at infinite dilution- Ionic mobility- Transport number- determination of transport number- Hittorf's method- moving boundary method- Kohlrausch's law of independent migration of ions and its applications - Debye – Huckel-Onsager equation (Derivation not required)- Applications of conductance measurements - determination of degree of dissociation of weak electrolytes- determination of pH - determination of solubility products of sparingly soluble salts - conductometric titrations.

Unit IV: Chemical kinetics

12 Hours

Terms in chemical kinetics- rate equation- rate constant – order of a reaction and examples for zero, first, second and third order reactions - unit of rate constants- molecularity of reactions- differences between order and molecularity. Derivation of rate constants for zero, first and second order ($2A \rightarrow \text{Product}$) reactions – characteristics of these reactions and examples - pseudo-unimolecular reactions – Experimental determination of order of a chemical reaction – use of differential and integral rate expressions - half life period method- isolation method. Kinetic study of some specific reactions- Catalytic decomposition of hydrogen peroxide – decomposition of dinitrogen pentoxide. Inversion of cane sugar and acid catalysed hydrolysis of ester.

Unit V: Chemical and ionic equilibria

12 Hours

The law of mass action- Thermodynamic treatment of law of mass action- K_p , K_c and K_x and the relationship among them - van't Hoff reaction isotherm – Temperature dependence of the equilibrium constant : the van't Hoff equation and its integrated form (Derivation and problems)- Le Chatelier's principle.

Dissociation of weak acids and bases- Ostwald's dilution law - Dissociation constant of polybasic acids – Ionic product of water – the pH scale – Common ion effect - Buffer solutions – buffer action – pH of buffer mixtures : Henderson-Hasselbatch equation.

Recommended Books:

Units I, II and V

1. B.R. Puri, L.R. Sharma and M.S. Pathania, Principles of Physical Chemistry, Vishal Publishing Co., Jalandhar, 2003.
2. P.L. Soni, Principles of Physical Chemistry, S. Chand & Co., New Delhi, 1980.
3. B.S. Bahl, G.D. Tuli and Arun Bahl, Essentials of Physical Chemistry, S.Chand & Co., New Delhi, 2000.



4. S. Glasston, Thermodynamics for Chemists, East-West Press Private Ltd., New Delhi, 1969.
5. J. Rajaram and J.C. Kuriakose, Thermodynamics for Students of Chemistry, Shoban Lal Nagin Chand & Co., 1986.

Unit III

1. B.Viswanathan, S. Sundaram, R. Venkataraman, K. Rengarajan and P.S. Raghavan, Electrochemistry-Principles and Applications, S. Viswanathan Printers and Publishers Pvt., Ltd., 2007.
2. D.R. Crow, Principles and Application of Electrochemistry, Chapman Hall, London 1988.
3. L.Antropov, "Theoretical Electrochemistry" Mir Publications, Moscow, 1972.
4. S.Glasstone, An Introduction to Electrochemistry, East west Press private limited, New Delhi, 2000.

Unit IV

1. K.J. Laidler, Chemical Kinetics, 3rd Edn., Harper International Edn., London, 1987.
2. K.J. Laidler, Theories of Chemical Reaction Rates, McGraw Hill Book Co., London, 1969.
3. C. Kalidas, Chemical Kinetic Methods, New Age International, 1996.

Part III Core subject VII – Inorganic Chemistry I

Hours per week: 4

Credits: 4

Subject Code: U24CHC53

Course Outcome:

CO1: To understand the general characteristics of Group IV(B) and Group V(B) d-block elements

CO2: To study the general characteristics of Group VI(B) and Group VII(B) d-block elements

CO3: To know the basics of co-ordination chemistry

CO4: To acquire knowledge on various theories of bonding to explain the formation coordination compounds

CO5: To know the basics of error analysis in Analytical Chemistry

Unit I: d-Block elements I

12 hours

General characteristics of d-block elements: Metallic character and related properties, variable oxidation states, colour of transition metal complexes and magnetic properties.

Comparative studies of Group IV(B) elements Ti, Zr and Hf - Extraction, properties and uses of titanium - Preparation and uses of TiO₂ and TiCl₄.

Comparative studies of Group V(B) elements V, Nb and Ta - Extraction, properties and uses of vanadium - compounds of vanadium.

Unit II: d-Block elements II

12 hours

Comparative studies of Group VI(B) elements Cr, Mo and W – Extraction and uses of chromium, compounds of chromium - Lead chromate, basic lead chromate and basic zinc chromate.

Comparative studies of Group VIII elements Fe, Co and Ni- Extraction, preparation and uses Cobalt. Preparation and uses of sodium cobaltnitrite. Platinum - Extraction, properties and uses – Preparation and uses of platinised asbestos, spongy platinum, platinum black. Colloidal platinum and potassium chloroplatinate.



Comparative study of Cu, Ag and Au. Comparative study of Zn, Cd and Hg.

Unit III: Coordination Chemistry I

12 hours

Complex ion - neutral complex - coordination number - coordination sphere. Ligands - classification of ligands - ambidentate ligands - flexidentate ligands - chelating ligands and their applications - bridging ligands - IUPAC naming of coordination compounds.

Isomerism in coordination compounds - structural isomerism - Stereo isomerism in 4 coordinated and six coordinated complexes – Werner's theory - postulates, example and its limitation. EAN rule and its correlation to stability.

Unit IV: Coordination Chemistry II

12 hours

Valence bond theory - Postulates- applications of VBT to 4 coordinated and 6 coordinated complexes - inner and outer orbital octahedral complexes- limitations of VBT.

Crystal Field theory - postulates- splitting of d-orbitals in tetrahedral and octahedral field - factors influencing the magnitude of $10 Dq$ - spectrochemical series- condition for the formation of high and low spin complexes - crystal field stabilization energy - calculation of CFSE and spin only magnetic moment - applications of crystal field theory - limitations of CFT - comparison between VBT and CFT.

Unit V: Error analysis and curve fitting

12 hours

Accuracy – precision – errors- absolute error - relative error - classification of errors - minimisation of errors - significant figures - rules for identifying significant figures – statistical treatment of data: Range, average, median, deviation, mean deviation, relative mean deviation, standard deviation, variance, linear regression and correlation co-efficient. Rejection of experimental data - Q-test - Student's t-test - Analysis of experimental results – graphical method – linear curve fitting - least square method (straight line equation).

Reference Books:

Unit I

1. Sathya Prakash's Modern Inorganic Chemistry, R.D.Madan, S.Chand & Co., New Delhi, 2005.
2. Advanced Inorganic Chemistry, Sathya Prakash, Volume I and II, S.Chand & Co., New Delhi, Revised reprint, 2013.
3. P. L. Soni and M. Katyal, Textbook of Inorganic Chemistry, Sultan Chand and Sons, New Delhi.

Unit-II

1. Sathya Prakash's Modern Inorganic Chemistry, R.D.Madan, S.Chand & Co., New Delhi, 2005.
2. Advanced Inorganic Chemistry, Sathya Prakash, Volume I and II, S.Chand & Co., New Delhi, Revised reprint, 2013.

Units II & IV

1. Sathya Prakash's Modern Inorganic Chemistry, R.D.Madan, S.Chand & Co., New Delhi, 2005.
2. B.R. Puri, L.R. Sharma and K.C. Kalia, Principles of Inorganic Chemistry, Milestone Publishers, 2010.
3. R. Gopalan and V. Ramalingam, Concise Coordination Chemistry, Vikas Publishing House Private Limited, New Delhi, 2010.
4. Advanced Inorganic Chemistry, Sathya Prakash, Volume I and II, S.Chand & Co., New Delhi, Revised reprint, 2013.



Unit V

1. Vogel's Text Book of Quantitative Chemical Analysis, V Edition, ELBS, 1989.
2. B.R. Puri, L.R. Sharma and K.C. Kalia, Principles of Inorganic Chemistry, Milestone Publishers, 2010.

Course Title : ELECTRICITY & ELECTRONICS	Total Hours : 4
Course Code : U1PHA5X3/ U24PHAY51	Total Credits : 4

Course Outcomes

COs	CO Statement
CO1	Understanding the fundamentals electrostatic parameters, Gauss's law and its application, Electric Potential, Capacitance and different types Capacitors.
CO2	Learning about Kirchoff's Laws and its applications, principle of potentiometer.
CO3	Studying the principle & working of galvanometer and LCR circuits.
CO4	Knowing about the performance of transistor amplifiers and op-amps.
CO5	Understanding Number systems and the principles of digital electronics.

UNIT - I:

12 Hours

Electrostatics: Introduction – Coulomb's law – Electric Field – Electric Field due to a point charge – Flux of the electric field - Gauss's law – Proof – Applications: Electric field due to a uniformly charged sphere and an infinite plane sheet of charge – Field near a charged conducting cylinder – Coulomb's theorem – **Electric potential:** Potential difference – Potential at a point due to a point charge – Relation between electric field and electric potential – **Capacitor:** Introduction – Capacitance of parallel plate (with and without dielectric slab), spherical (outer sphere earthed) and cylindrical capacitors – Energy stored in a charged capacitor – Loss of energy due to sharing of charges.

UNIT-II:

12 Hours

Current Electricity: Kirchoff's laws – Application: Wheatstone's network – Sensitiveness of bridge – Wheatstone's Network - Carey Foster's bridge – measurement of resistance and temperature coefficient of resistance – Principle of potentiometer – Calibration of ammeter and voltmeter (low range and high range) – measurement of resistance using potentiometer.

UNIT-III:

12 Hours

Magnetic effect of Electric current: Oersted's experiment – Force on a current carrying conductor - Torque on a current loop – Moving coil ballistic galvanometer (B.G) & Damping correction – expression for charge sensitiveness – comparison of e.m.f's and comparison of capacitors using B.G.

Alternating Current: Electromotive force generated in a coil rotating in a uniform magnetic field – R.M.S and mean value of alternating voltage and current – LCR circuit: impedances – Series and Parallel resonant circuits.



UNIT-IV:

12 Hours

Electronics: Formation of Junction diodes – Forward and reverse bias – Diode characteristics – Zener Diode and characteristics - LED – Bridge rectifier using junction diodes – π filter – Transistor: working (n-p-n) - characteristics (CE mode only) – Biasing – Voltage divider bias - Modulation (qualitative study) – Op-amp and its characteristics – CMRR – slew rate - Virtual earth – Voltage amplifier (inverting and non-inverting mode) – Op-amp as adder and subtractor.

UNIT-V:

12 Hours

Number systems and codes: Decimal & Binary number system – binary to decimal and decimal to binary conversions – addition and subtraction of binary numbers – Logic circuits: Boolean algebra – De Morgan's theorem – OR, AND, NOT, NOR & NAND gates – NOR & NAND gates as universal building blocks – Ex-OR gate.

Book for study:

1. **R.Murugesan. Electricity and Electronics. Madurai: Annani Print Park; 2017.**

Unit I : Chapter 1 – 1.1 – 1.19

Unit II : Chapter 2 – 2.1 – 2.6

Unit III : Chapter 3 – 3.1 – 3.3, 3.6 – 3.7, 3.9 - 3.17

Unit IV : Chapter 4 – 4.1 – 4.13, 4.16 - 4.25

Unit V : Chapter 5 – 5.1 – 5.18

Books for Reference:

1. B.L.Theraja. Solid State Electronics. New Delhi: S. Chand Pvt Ltd; 2003.

2. Brijlal and Subramanyam. Electricity and Magnetism New Delhi: S. Chand Pvt Ltd; 2007.

EMPLOYABILITY SKILLS

Course Title : Employability Skills	Total Hours : 30 Hours
Course Code : U24PS51	Total Credits : 1

COURSE OUTCOMES:

On completing this course, students can/are able to

Cos	CO STATEMENT
CO1:	enhance their skills in solving quantitative aptitude problems
CO2:	expertise themselves in solving verbal and non-verbal reasoning problems.
CO3:	prepare for various public and private sector exams and placement drives.
CO4:	interpret the concepts of LOGICAL REASONING Skills.
CO5:	analyze the problems logically and approach the problems in a different manner



Unit I: Quantitative Aptitude – I **6 Hours**

H.C.F. and L.C.M. of Numbers - Average - Percentage - Profit and Loss - Ratio and Proportion - Time and Work - Time and Distance - Train Speed.

Unit II: Quantitative Aptitude – II **6 Hours**

Area related problems - Problems on Ages - Boat and Stream - Simple Interest - Compound Interest – True discount – Calendar – Clocks - Data Interpretation - Bar Graphs - Pie Chart.

Unit III: Verbal Reasoning – I **6 Hours**

Analogy - Classification – Series - Coding & Decoding - Coded inequality - Blood relations - Direction sense test.

Unit IV: Verbal Reasoning – II **6 Hours**

Number Test - Ranking and Time Sequence Test - Seating arrangements - Alphabet Test - Logical Venn Diagram.

Unit V: General Knowledge **6 Hours**

Abbreviations & Acronyms - Famous Personalities - Important Days (National & International) - Capital Cities and Currencies – Current affairs - Sports – RBI & Banking Terms – Basics of Computers and Internet.

Reference Books:

1. R.S.Agarwal, Quantitative Aptitude for Competitive Examinations, S Chand Publishing company; Revised edition (21 February 2017).
2. R.S.Agarwal, A modern approach to logical reasoning, S Chand Publishing company; August 2022.
3. R.S.Agarwal, A Modern Approach To Verbal Reasoning (Old Edition), S Chand Publishing company.
4. R.S.Agarwal, Advanced objective general knowledge revised edition, S Chand Publishing company, 2017.

e-Resources:

1. <https://www.cuemath.com/numbers/hcf-and-lcm/>
2. <https://www.geeksforgeeks.org/speed-time-distance-formula-and-aptitude-questions/>
3. <chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://cdn1.byjus.com/wp-content/uploads/2020/06/Boat-Stream-Sample-Questions.pdf>
4. <https://www.hitbullseye.com/Simple-Interest-and-Compound-Interest.php>



5. <chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://examsdaily.in/wp-content/uploads/2018/09/br.pdf>
 6. <https://testbook.com/objective-questions/mcq-on-direction-and-distance--5eea6a0e39140f30f369e42a>
 7. <https://unacademy.com/content/cat/study-material/data-interpretation-and-logical-reasoning/ranking-and-time-sequence/>
 8. <https://www.toppr.com/guides/computer-aptitude-and-knowledge/basics-of-computers/basic-computer-terminology/>
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Non Major Elective-I
Chemistry in day-to-day life

Hours per week: 2
Course Outcome:

Credits: 2

Subject Code: U24CHN51

CO1: To get knowledge on cosmetics

CO2: To know about polymers and their role

CO3: To learn the chemical aspects of milk and milk products

CO4: To understand the role of chemistry in Food Science

CO5: To acquire the fundamental aspects of drugs.

Unit I: Cosmetics

6 Hours

Tooth powder, tooth paste, soaps and detergents - cleansing action - differences between soaps and detergents- talcum powder, lipstick, nail polish, eyetex, shampoo, hair dye, perfumes-vanishing creams.

Unit II: Polymers in our life

6 Hours

Polymers and their classification with examples; Thermo and thermosetting polymers
Commercial polymers: Polyethylene, PVC & Polyesters (Elementary ideas only-Definition, examples & uses); Plastic identification code & Recycle.
Biomedical applications of polymers: Polymers used in surgery, medicine, contact lens, dental polymers, artificial heart & kidney.

Unit III: Milk and Milk products

6 Hours

Composition of milk – flavor and aroma – physical properties – pasteurisation – methods of pasteurisation – effects of pasteurisation. Ice cream – stabilizers – emulsifier. Dry milk – types, properties and uses.

Unit IV: Food Chemistry

6 Hours

Food - Nutrients - Classification, sources and functions of Carbohydrate, Proteins, Vitamins and Fat- Adulteration of food - Food preservatives - Qualities of food preservatives, examples, Bad effects – Iodized salt- Colouring agents and Flavouring agents.



Unit V: Chemistry of Drugs

6 Hours

Drugs: definition and uses of antibiotics, anesthetics, antiseptics, antacids, antipyretics, hypnotics, sedatives, laxatives, dental cement, and antimalarial drugs. Anticancer drugs: *cis*-platin and cobalt therapy.

Reference Books:

Units I and II

1. B.K. Sharma, Industrial Chemistry, Goel Publishing House, 1994.

Unit III

1. Fundamental Concepts of Applied Chemistry, Jeyashree Ghosh, S. Chand & Company Ltd., 2008.

Unit IV

1. N.Shakuntala Manay and M.Shadaksharaswamy, Food, Facts and Principles, New age International Publisher, New Delhi, Third edition, 1997.
2. Lillian Hoagoland Meyer, Food Chemistry, CBS Publishers and Distributors, New Delhi, 1994.
3. B.Srilakshmi, Food Science, New Age International Publishers, New Delhi, Fifth edition, 2010.

Unit V

1. A Text Bbook of P harmaceutical Chemistry, Jeyashree Ghosh, S. Chand and Company Ltd., Ram Nagar, New Delhi, 2003.

SEMESTER-VI
ORGANIC CHEMISTRY II

Hours per week: 4

Credits: 4

Subject Code: U24CHC61

Course Outcomes :

CO1: To offer sufficient basic knowledge molecular rearrangements

CO2: To provide basic knowledge on spectroscopy of organic molecules

CO3: To inculcate the curiosity in learning alicyclic compounds and conformational analysis.

CO4: To study the structural elucidation of a few alkaloids and terpenes

CO5: To impart the knowledge on proteins, nucleic acids and dyes

Unit I: Molecular rearrangements

12 hours

Molecular rearrangements - definition- Intra & Inter molecular rearrangement reactions- methods used to identify the inter and intra molecular rearrangement - Detailed mechanism of the following rearrangements - Carbon to carbon migration (rearrangement to electron deficient carbon) - Pinacol-pinacolone, Benzil- benzilic acid, Carbon to nitrogen migration (rearrangement to electron deficient nitrogen) - Hofmann, Beckmann rearrangement – Aromatic rearrangement - Claisen, Benzidine, Fries rearrangement.

Unit II: Spectroscopy of organic molecules

12 hours

UV Spectroscopy: absorption laws- types of electronic transition- bathochromic, hypsochromic, hyperchromic and hypochromic effects - applications of UV spectroscopy to organic compounds- Woodward- Fieser rule applied to conjugated dienes and α,β -unsaturated ketones.

IR Spectroscopy: Introduction-mode of vibration-selection rule-group frequency concept-application of IR to organic compounds-Finger print region - effect of hydrogen bond.

NMR Spectroscopy: Introduction- chemical shift- shielding and deshielding effects-factors influencing chemical shift value- use of TMS as reference - splitting of signals- coupling



constants- ^1H NMR spectra of simple organic compounds like bromoethane, ethanol, propanal, benzene and benzaldehyde.

Unit III: Alicyclic compounds and Conformational analysis **12 hours**

Alicyclic compounds: General methods of preparation and properties of cycloalkanes- Bayer's strain theory and its modification. Synthesis of Civetone and muscone (any one method) - structure only (elucidation not necessary)

Conformational analysis: Difference between configuration and conformation. Fischer, Sawhorse and Newmann projection formula- conformational analysis of ethane, n-butane, 1,2- dichloroethane, cyclohexane and monosubstituted cyclohexane.

Unit IV: Alkaloids and Terpenes **12 hours**

Alkaloids: General methods of isolation and determination of structure of alkaloids - classification of alkaloids- structural elucidation of the following alkaloids – Coniine, piperine (piperidine alkaloids) and nicotine (pyrrolidine-pyridine alkaloids).

Terpenes: Introduction, classification, occurrence and isolation-general properties- isoprene rule- general methods for determining structure – structural elucidation of citral, geranial (acyclic terpene) and terpineol (monocyclic terpene).

Unit V: Proteins, Nucleic acids and Dyes **12 hours**

Proteins: definition - classification of proteins - colour reactions of proteins- primary, secondary, tertiary and quaternary structure of proteins (an elementary idea only).

Nucleic acids: Nucleosides and Nucleotides- RNA and DNA - structure and differences.

Dyes: Definition- theories of colour and constitution - classification of dyes according to their structure and application. Azo dyes- preparation of methyl orange & Congo red- triphenyl methane dyes - preparation of malachite green, rosaniline and crystal violet- Phthalein dyes- preparation of phenolphthalein, fluorescein and eosin- Vat dyes- preparation of indigo.

Reference Books:

Units I, III, IV and V:

1. I.L. Finar, Organic Chemistry Vol.I, ELBS, 6th edition, 1973.
2. I.L. Finar, Organic Chemistry Vol.II, ELBS, 6th edition, 1973.
3. R.T. Morrison and R.W.Boyd, Organic Chemistry, Printice Hall of India Private Ltd, 6 th edition, 2001.
4. P.L.Soni, Organic Chemistry, Sultan Chand & Sons,New Delhi, 29th edition, 2007.
5. B.S.Bahl and Arun Bahl, Advanced Organic Chemistry, S.Chand & Company Ltd, Ram Nagar, New Delhi,14th edition,1996.
6. M.K. Jain and S.C. Sharma, Modern Organic Chemistry, Vishal Publishing Co, Jalandhar-Delhi, 4th edition, 2013

Unit II

1. P.S Kalsi, Spectroscopy of Organic Compounds, New Age International (P) Ltd, Sixth edition, 2004.
 2. B.M.Silverstein, G.C.Bassler and T.C.Morrill, Spectroscopic Identification of Organic Compounds. John Wiley & Sons Inc, 6th edition, 2005.
 3. William Kemp, Organic Spectroscopy, Mac Millan Press Ltd, First edition, 1975.
 4. Y.R. Sharma Elementary Organic Spectroscopy, S.Chand & Co, New Delhi, Fourth Edition, 2007.
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Physical Chemistry II

Hours per week: 4 Credits: 4 Subject Code: U3CHC62/ U24CHC62

Course Outcomes :

CO1: To solve thermo-chemical equations and to get basic ideas on thermodynamics of open systems

CO2: To understand the basic concepts of group theory in Chemistry

CO3: To get basic ideas and applications of molecular spectroscopy of IR,

CO4: To get basic ideas and applications of molecular spectroscopy of Raman, NMR and EPR.

CO5: To acquire basic knowledge behind various photophysical and photochemical processes

Unit I: Thermodynamics III

12 Hours

Thermo chemistry- Hess's law of constant heat summation – Kirchoff's equation – Bond enthalpies and its applications in the determination of enthalpies of reactions, enthalpies of formation of compounds and resonance energy.

Thermodynamics of open systems- Partial molar quantities – definition and significance of chemical potential –Gibbs-Duhem equation – variation of chemical potential with temperature and pressure– Clausius-Clapeyron equation – derivation and applications – Concept of fugacity- determination- physical significance-concept of activity- activity coefficient- reference or standard states of gas, liquid and solid.

Nernst heat theorem- formulation of third law of thermodynamics- concept of residual entropy.

Unit II: Group theory

12 Hours

Molecular symmetry elements and symmetry operations – classification of group- definitions, theorems and grammar of group theory- subgroups- product of symmetry operations – classes and similarity transformation –Inverse and cyclic rules for writing group multiplication table - Classification of molecules into point groups – rotational (C & S), Dihedral (D) and T- type (T_d & O_h) point groups with examples. Transformation matrices of symmetry operations.

Unit III: Molecular Spectroscopy I

12 Hours

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

Rotational spectra of diatomic molecules – rigid rotator (no derivation) – selection rule – determination of moment of inertia and bond length.

Vibrational spectra – IR spectra of diatomic molecules – Hooke's law – simple harmonic oscillator (no derivation) - force constant – selection rule – vibrational energy level diagram – applications – force constant determination. Modes of vibration in polyatomic molecules – vibrational spectra of H_2O and CO_2 - Rotational vibrational spectra of diatomic molecules.

Unit IV: Molecular Spectroscopy II

12 Hours

Raman spectra – Raman effect – Stokes and anti-Stokes lines – quantum theory of Raman effect – experimental study – comparison between IR and Raman spectroscopy – applications of Raman spectra- Electronic Spectroscopy – Franck-Condon principle-Types of electronic transition- Nuclear magnetic resonance spectroscopy – theory of NMR spectroscopy- types of NMR spectroscopy- Position of NMR signals- chemical shift- number and position of NMR signals – 1H NMR spectra of ethanol - Electron paramagnetic resonance spectroscopy – principle – difference between NMR and EPR –EPR spectrum of hydrogen and methyl radicals.



Unit V: Photochemistry

12 Hours

Definition of photochemical reactions – comparative study of thermal and photochemical reactions – laws of photochemistry – Lambert and Beer's law – Grotthus-Draper's law – Stark-Einstein law – quantum efficiency and its determination – reasons for high and low quantum efficiency - consequence of light absorption by atoms and molecules – Jablonski diagram - photophysical processes – fluorescence, phosphorescence and other deactivating processes – Photochemical processes – kinetics of photochemical reactions. Gaseous reactions: Hydrogen-halogen reactions (formation of HCl and HBr and decomposition of HI) - Photosensitization, chemiluminescence – bioluminescence.

Recommended Books:

Unit I

1. B.R. Puri, L.R. Sharma and M.S. Pathania, Principles of Physical Chemistry, Vishal Publishing Co., Jalandhar, 2010.
2. P.L. Soni, Principles of Physical Chemistry, S. Chand & Co., New Delhi, 1980.
3. B.S. Bahl, G.D. Tuli and Arun Bahl, Essentials of Physical Chemistry, S.Chand & Co., New Delhi, 2000.

Unit II

1. F.A.Cotton, Chemical Applications of Group Theory, 3rd, Edn., John Wiley & Sons, New York, 1999.
2. V.Ramakrishnan and M.S. Gopinath, Group Theory in Chemistry, 2nd Edn., Vishal Publications, 1991.
3. K.V. Raman, Group Theory and its Application to Chemistry, Tata McGraw-Hill Pub. Co., 1990.

Units III and IV

1. C.N.Banwell and E.M.McCash, Molecular Spectroscopy, Tata McGraw Hill, 4th Edn., 1995.
2. G. Aruldas, Molecular Structure and Spectroscopy, Prentice-Hall of India Pvt., Ltd., New Delhi, 2001.

Unit V

1. K.K. Rohatgi Mukherjee, Fundamentals of Photochemistry, New age international private limited, 2000.
2. N.J. Turro, Modern Molecular Photochemistry, Benjamin Cummings, 1965.

Part III Core subject X – Inorganic Chemistry - II

Hours per week: 4

Credits: 4

Subject Code: U24CHC63

Course Outcome:

CO1: To get the knowledge on the structure and functions of metalloporphyrin, and metal ion toxicity and chelate therapy.

CO2: To understand the various concepts of acids and bases, and non-aqueous solvents

CO3: To study the preparation, properties, structure and bonding in metal carbonyls

CO4: To know and compare the properties of lanthanides and actinides.

CO5: To acquire the knowledge on the theory and applications of gravimetric and thermos analytical methods

Unit I: Bio-inorganic chemistry

12 Hours

Porphyrin ring system – metalloporphyrin - Iron porphyrins - structure and functions of hemoglobin and myoglobin - Bohr effect - explanation for cooperativity effect. Structure and



functions of chlorophyll – ionophores - sodium-potassium ion pump. Metal ion toxicity and chelate therapy.

Unit II: Acids, bases and non-aqueous solvents

12 Hours

Arrhenius concept – Bronsted-Lowry concept - conjugate acid-base pair - Amphiprotic substances - levelling effect - Lux-Flood concept – Lewis concept- Relative strength of acids and bases: substituent effect- steric effect - F-strain - Usanovich concept- HSAB concept.

Classification of solvents – non- aqueous solvents - chemical reactions in liquid ammonia: precipitation reactions- Acid- base reactions - complex formation reactions - Ammonolysis reactions - protolysis reaction - solvation reaction - metal-ammonia solution and their reactions.

Unit III: Metal Carbonyls

12 Hours

π - Acid complexes - low oxidation state of metal in metal carbonyls. Classifications of metal carbonyls - EAN rule applied to metal carbonyls. Bonding of metal carbonyls – Identification of metal carbonyls by IR spectroscopy. General methods of preparation and properties. Structure of $\text{Cr}(\text{CO})_6$, $\text{Ni}(\text{CO})_4$, $\text{Fe}(\text{CO})_5$, $\text{V}(\text{CO})_6$, $\text{Mn}_2(\text{CO})_{10}$, $\text{Fe}_2(\text{CO})_9$, $\text{Co}_2(\text{CO})_8$ and $\text{Fe}_3(\text{CO})_{12}$.

Unit IV: f-Block elements

12 Hours

Lanthanide series - electronic configuration - oxidation states - atomic and ionic radii of M^{3+} ions - Lanthanide contraction - colour of M^{3+} cations - occurrence, extraction of lanthanides from monazite sand.

Actinide series –occurrence - electronic configuration - oxidation states - atomic and ionic radii of M^{3+} ions - Actinide contraction - colour of M^{3+} cations. Comparison between lanthanides and actinides. Trans-uranic elements.

Unit V: Gravimetric and Thermo analytical methods

12 Hours

Gravimetric analysis: Principle – mechanism of precipitation – factors affecting solubility of precipitates - Coprecipitation - Post precipitation. Digestion, Washing and Drying/Ignition of the precipitate.

Thermo analytical method – Principle of thermogravimetry, differential thermal analysis- Instrumentation for TGA and DTA – factors affecting TGA and DTA curves – TGA and DTA of calcium oxalate monohydrate and copper sulphate pentahydrate.

Reference Books:

Unit I

1. B.R. Puri, L.R. Sharma and K.C. Kalia, Principles of Inorganic Chemistry, Milestone Publishers, 2010.
2. Bertini, H.B. Gray, S.J. Lippard and J.S. Valentine, Bioinorganic Chemistry, Viva Books Private Limited., 1998.
3. R. Gopalan and V. Ramalingam, Concise Coordination Chemistry, Vikas Publishing House Private Limited, New Delhi, 2010.

Units II and III

1. Sathya Prakash's Modern Inorganic Chemistry, R.D.Madan, S.Chand & Co., New Delhi, 2005.
2. Advanced Inorganic Chemistry, Sathya Prakash, Volume I and II, S.Chand & Co., New Delhi, Revised reprint, 2013.
3. B.R. Puri, L.R. Sharma and K.C. Kalia, Principles of Inorganic Chemistry, Milestone Publishers, 2010.
4. R. Gopalan and V. Ramalingam, Concise Coordination Chemistry, Vikas Publishing House Private Limited, New Delhi, 2010.



Unit IV

1. Sathya Prakash's Modern Inorganic Chemistry, R.D. Madan, S.Chand & Co., New Delhi, 2005.
2. Advanced Inorganic Chemistry, Sathya Prakash, Volume I and II, S.Chand & Co., New Delhi, Revised reprint 2013.
3. B.R. Puri, L.R. Sharma and K.C. Kalia, Principles of Inorganic Chemistry, Milestone Publishers, 2010.
4. P. L. Soni and M. Katyal, Textbook of Inorganic Chemistry, Sultan Chand and Sons, New Delhi.

Unit V

1. Vogel's Text Book of Quantitative Chemical Analysis, V Edition, ELBS, 1989.
2. B.R. Puri, L.R. Sharma and K.C. Kalia, Principles of Inorganic Chemistry, Milestone Publishers, 2010.
3. B.K. Sharma, Instrumental methods of Chemical Analysis, Goel Publishing House 23rd Edition, 2004.

Part III – Core III – LAB: Organic Preparation and Gravimetric Estimation

Hours per week: 3

Credits: 3

Subject Code: U24CHCP61

Course Outcome:

CO1: To study the theory of preparation of organic compounds by oxidation and hydrolysis

CO2: To familiarize the principle of preparation of organic compounds by acetylation, benzoylation and addition

CO3: To understand the concept behind the preparation of organic compounds by bromination and nitration

CO4: To acquire knowledge on gravimetric estimation of metal by replacement reaction

CO5: To get the knowledge on gravimetric estimation of metal by chelation

Organic preparation:

1. Oxidation : Preparation of benzoic acid from benzaldehyde
2. Hydrolysis: (i) Preparation of benzoic acid from benzamide
(ii) Preparation of benzoic acid from ethyl benzoate.
3. Acetylation: Preparation of acetanilide from aniline
4. Bromination: Preparation of p-bromoacetanilide from acetanilide
5. Nitration: (i) Preparation of m-dinitrobenzene from nitrobenzene
(ii) Preparation of picric acid from phenol.
6. Benzoylation: Preparation of β -naphthyl benzoate from β -naphthol
7. Addition: Preparation of osazone from glucose.

Gravimetric Estimation:

1. Estimation of lead as lead chromate.
 2. Estimation of barium as barium chromate.
 3. Estimation of calcium as calcium oxalate
 4. Estimation of copper as cuprous thiocyanate.
 5. Estimation of nickel as Ni-Dimethylglyoxime.
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Part III – Core IV – LAB: Organic Analysis and Organic Estimation

Hours per week: 3

Credits: 3

Subject Code: U24CHCP62

Course Outcome:

- CO1:** To acquire knowledge on the analysis of simple organic compounds.
CO2: To understand the basic principles to confirm the presence of saturation/unsaturation and aliphatic/aromatic nature of organic compounds
CO3: To confirm the presence of elements in the organic compounds other than carbon, hydrogen and oxygen
CO4: To get the knowledge on confirming the functional group(s) present in an organic compound by preparing a solid derivative
CO5: To know the fundamental strategies of organic estimation

Organic Analysis

Analysis of organic compound containing one or two functional groups and confirmation by preparing of a solid derivative – acids, phenols, aldehydes, ketones, esters, nitro compounds, amines, amides, anilides, aliphatic diamide, and sulphur analogue of diamide, carbohydrate.

Organic Estimation

1. Estimation of phenol
2. Estimation of aniline

Part III Core V - LAB – Physical Chemistry Experiments

Hours per week: 2

Credits: 4

Subject Code: U24CHCP63

Course Outcome:

The theoretical concepts dealt in the physical chemistry theory papers are given as experiments for the better understanding of the concepts.

- CO1:** To determine of molecular weight by Transition temperature and Cryoscopic methods
CO2: To interpret the simple eutectic phase diagram and determine the CST of phenol-water system
CO3: To find out the of heat of solution of oxalic acid, $K_2Cr_2O_7$ and $(NH_4)_2C_2O_4$ in water
CO4: To compare the relative strength of acids by applying chemical kinetics
CO5: To carryout acid-base and redox titrations by Conductometric and Potentiometric methods

I. Determination of molecular weight by

1. Transition temperature method – Sodium thiosulphate pentahydrate, sodium acetate trihydrate
2. Cryoscopic method –Rast method

II. Phase diagram

1. Simple eutectic phase diagram

III. Critical Solution Temperature

1. Determination of CST of phenol – water system
2. Effect of impurity on CST of phenol water system

IV. Heat of Solution

1. Determination of heat of solution of oxalic acid in water
2. Determination of heat of solution of $K_2Cr_2O_7$ in water
3. Determination of heat of solution of $(NH_4)_2C_2O_4$ in water

V. Kinetic experiments



1. Kinetics of acid catalysed hydrolysis of ester
 - a) Determination of rate constant of the reaction
 - b) Determination of relative strength of acids.

VI. Conductometric methods

1. Acid base titration: $\text{NH}_4\text{Cl} \rightarrow \text{NaOH} \rightarrow \text{HCl}$
2. Determination of cell constant of the given cell and determination of dissociation constant of weak acid.

VII. Potentiometric methods

1. Acid base titration: HCl vs NaOH
2. Redox titration: KMnO_4 vs FAS

Course Title : OPTICS & PHOTONICS	Total Hours : 4
Course Code : U1PHA6X4/ U24PHAY61	Total Credits : 4

Course Outcomes

COs	CO Statement
CO1	Understanding of the properties of lenses and working of system of lenses
CO2	Learning the basics of Dispersion and Aberrations.
CO3	Getting basic knowledge of Interference and Diffraction
CO4	Knowing about Polarization and Types of Polarization
CO5	Learning the Fibre optic communication system & Basic atom laser

UNIT: I

12 Hours

Geometrical Optics : Introduction – Lenses – Terminology – Conjugate points, planes and distances – Image tracing – Location of the image – Sign convention – Thin Lens – Lens equation – Lens maker's equation – Newton's lens equation – Magnification, smallest separation of object and real image – Displacement of lens when object and screen are fixed – Deviation by a thin lens – Power.

UNIT: II

12 Hours

Dispersion and Aberrations: Dispersion by a prism – Refraction through a prism – Angular dispersion – Dispersive power – Angular and chromatic dispersions – Achromatic combination of prisms (Deviation without dispersion) – Dispersion without deviation – Direct vision spectroscope – Aberrations – Spherical aberration – Chromatic aberration- Chromatic aberration in a lens.

UNIT: III

12 Hours

Interference and Diffraction: Thin film – Interference due to transmitted light variable thickness (wedge-shaped) film – Determination of the wedge angle – Determination of the thickness of the spacer – Newton's rings – Condition for bright and dark rings – Determination of wavelength of light – Fresnel diffraction – Huyens-fresnel theory – Zone plate – Distinction between interference and diffraction - Plane diffraction grating – Theory of plane transmission grating.



UNIT: IV

12 Hours

Polarization: Introduction – Polarization – Un-polarized and polarized light – Natural light is un-polarized light – Types of Polarization – Polarizer and Analyser – Double refraction in calcite crystal – Nicol prism.

UNIT: V

12 Hours

Photonics: Fibre optics – Total internal reflection – Numerical aperture – Classification of optical fibre (single mode, multi-mode and graded index fibre) – Fibre optic communication system – Merits of optical fibre – Basic atom laser – Applications of atom laser.

Book for study:

1. N. Subrahmanyam Brijlal, M.N. Avadhanulu, A Text Book of Optics, 25th revised edition, 2018, S. Chand and company, New Delhi.

Unit I : Chapter 4 – 4.1 - 4.16.

Unit II : Chapter 8 – 8.1 - 8.8.
Chapter 9 – 9.2, 9.5, 9.10, 9.11.

Unit III : Chapter 15–15.1, 15.3, 15.5, 15.5.1, 15.5.2, 15.6, 15.6.1, 15.6.7.
Chapter 17 & 18 – 17.1, 17.2, 17.6, 18.7, 18.7.1.

Unit IV : Chapter 20 – 20.1 - 20.5, 20.5.1 – 20.5.4, 20.8, 20.11, 20.12.

Unit V : Chapter 24 – 24.1, 24.3, 24.6, 24.10, 24.11.1–24.11.3, 24.21, 24.22.
Chapter 26 – 26.6, 26.6.1, 26.6.2, 26.7, 26.7.1- 26.7.3.

Book for Reference:

1. Fundamentals of Optics – Devraj Singh, second edition, 2015-PHI Learning Private Ltd. New Delhi.
2. Optics and Spectroscopy – R.Murugesan, S. Chand and co., 6th Edition, New Delhi, 2008.
3. Optics, Ajoy Ghatak, (TMH), New Delhi, Fourth edition, 2009

Course Title : ALLIED LAB: PHYSICS PRACTICAL –II	Total Hours : 2
Course Code : U2PHA6PX/ U24PHAYP61	Total Credits : 2

Course Outcomes:

COs	CO Statement
CO1	Applying optical principles to determine the wavelength of the light source.
CO2	Understanding the concepts of interference forming patterns.
CO3	Applying the principles of electromagnetism to determine the self-inductance of the coil.
CO4	Understanding the principles of digital electronics.
CO5	Studying the V-I characteristics of solid-state electronic devices.

1. Determination of number of lines per meter of the grating (N) and wavelength of prominent lines of the mercury spectrum (λ) using Spectrometer.



2. Determination of dispersive power of a prism using Spectrometer
 3. Determination of Radius of curvature of convex lens using Newton's rings.
 4. Determination of Thickness of hair using Air wedge
 5. Determine of Self-inductance of the coil by LCR Series resonance.
 6. Determine of Self-inductance of the coil by LCR Parallel resonance.
 7. Comparison of Capacitances of Capacitors using De Sauty's Bridge.
 8. Construction of Logic gates – AND, OR, NOT using discrete components.
 9. Construction of Logic gates – NAND, NOR using discrete components.
 10. Design and construction of Bridge rectifier.
 11. V-I Characteristics of Zener diode.
 12. Static characteristics of Transistor - CE mode.
 13. Verification of De Morgan's laws
 14. Construction of AND, OR, NOT using NAND as universal building block.
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PROJECT

Hours/week-2

Sub code: U1CH6PR/U24CH6PR

Credit: 2

Course Outcome:

- CO1:** To train the students in various research/industry learning skills like critical thinking, creativity, synthesis of knowledge, analyzing capacity, instrument basics and handling and scientific report writing.
- CO2:** To introduce the frontier areas of research in chemistry and in the interdisciplinary areas among students
- CO3:** To understand the scope of research programme in chemistry and in the interdisciplinary areas.
- CO4:** To get the exposure of the link between the laboratory work and industry
- CO5:** To inculcate the self-confidence and stand on their own legs by visiting places like reputed libraries/ industries/academic institutions and contacting the concerned persons

The project work (includes literature review/chemical factory industry visit training /National/University Research Labs visit training / Nuclear Plant/Quality control lab/R&D Lab/field work / theoretical / lab work) is to inculcate students to learn adequate knowledge on research methodology in the subject and prepare them for pursuing research in theoretical / experimental areas of the subject.

Project will be carried out by the final year students in the sixth semester under the guidance of respective guides. The Project work or Field Study is to be undertaken under the guidance of a Teacher of the Department. Projects will be carried out in groups (with maximum of 5 students per group). For projects internal marks (max 50) will be awarded by the respective guide and external marks (max 50) will be awarded by the external examiner during summative practical examination.



INDUSTRIAL CHEMISTRY (UG-NME)

Hours per week: 2

Credits: 2

Subject Code: U24CHN61

CO1: To familiarize about water and its treatment

CO2: To prepare cement and glass

CO3: To understand soaps and detergents

CO4: To have a knowledge on fertilizers

CO5: To identify a good fuel and their composition

Unit I: Water Treatment

6 Hours

Introduction- Sources and types (Hard and soft)- Water Analysis: Determination of pH, TDS and Total hardness by EDTA – Disadvantages of Hard water — Potable water (water for domestic supply) – desalination – reverse osmosis.

Unit II: Cement and glasses

6 Hours

Cement: Introduction – raw materials – manufacture of cement - setting of cement.
Glass: Introduction – raw materials, preparation, types and uses.

Unit III: Soaps and detergents

6 Hours

Soaps: Definition and types - manufacture of soaps - cleaning action of soap.

Detergents: Definition. Difference between soaps and detergents. Uses of soaps and detergents.

Unit IV: Fertilizers

6 Hours

Definition – Role of macro and micro nutrients in plant growth - mixed fertilizers – Biofertilizers and their advantages - Preparation and uses of urea and super phosphate.

Unit V: Fuels

6 Hours

Definition and classification of fuels – characteristics of a good fuel – advantages and disadvantages of solid, liquid and gaseous fuels – Fuel gases –composition and preparation of water gas, producer gas, L.P.G , Gobar gas and natural gas.

Reference Books:

1. N. Krishnamurthy, K. Jeyasubramanian and P. Vallinayagam, Applied Chemistry, Tata Mcgraw-Hill Publishing Company Limited, New Delhi, 1999.
 2. B.K. Sharma, Industrial Chemistry Goel Publishing House, 1994.
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