BHARATHI WOMEN'S COLLEGE (AUTONOMOUS), CHENNAI – 108 B.Sc. CHEMISTRY

(CBCS Syllabus for UG students admitted from the academic year 2019-20)

Course				Hrs			
Component	Code	Title of the paper	Credit	/week	ESE	CIA	Total
Lang	19LAA	General Tamil - I	3	6	75	25	100
Eng	19GEA	General English – I	3	4	75	25	100
Core T-1	19CCA	General Chemistry – I	5	6	75	25	100
Core	19CC1	Volumetric Analysis					
Practical-1		Practical-I	-	3	-	-	-
SBE-1 (Eng. for comm-I)	19SZ1	English for Communication- I	2	2	50	50	100
EVS	19EVS	Environmental Studies	2	3	75	25	100

SEMESTER I

SEMESTER II

Course Component	Code	Title of the paper	Credit	Hrs /week	ESE	CIA	Total
Lang	19LAB	General Tamil - II	3	6	75	25	100
Eng	19GEB	General English – II	3	4	75	25	100
Core T-2	19CCB	General Chemistry – II	5	6	75	25	100
Core Practical-1	19CC1	Volumetric Analysis Practical-I	5	3	60	40	100
SBE-2 (Eng. for comm-I)	19SZ2	English for Communication- II	2	2	50	50	100
VBE	19VBE	Valued Based Education	3	3	75	25	100

SEMESTER III

Course				Hrs			
Component	Code	Title of the paper	Credit	/week	ESE	CIA	Total
Lang	19LAC	General Tamil - III	3	6	75	25	100
Eng	19GEC	General English – III	3	4	75	25	100
Core T-3	19CCC	General Chemistry – III	5	6	75	25	100
Core Practical- 2	19CC2	Inorganic Qualitative Analysis Practical-II	-	3	-	-	-
Allied Theory	19ACA	Allied Chemistry-I	3	3	75	25	100
Allied Prostical I	19AC1	Allied Chemistry		3	_		
		Tactical	-	5	-		-
Comp. Skills	19SZ3	Computing Skill - Basic	2	2	75	25	100
NME-1	19NC1	Polymer Chemistry	2	2	75	25	100

SEMESTER IV

Course Component	Code	Title of the paper	Credi t	Hrs /week	ESE	CIA	Total
•	19LA		3	6			
Lang	D	General Tamil – IV			75	25	100
	19GE	General English – IV					
Eng	D	C	3	4	75	25	100
	19CC	General Chemistry – IV					
Core T-4	D		5	6	75	25	100
Core Practical-2	19CC2	Inorganic Qualitative Analysis Practical-II	5	3	60	40	100
Allied	19AC	Allied Chemistry-II					
Theory	В		3	3	75	25	100
Allied	19AC1	Allied Chemistry					
Practical-I		Practical	4	3	60	40	100
SBE-4	10074	Personality Development					
Pr.Devlp	19524		2	2	75	25	100
NME-II	19NC2	Agricultural Chemistry	2	2	75	25	100
Ext.Act			3	-	-		

SEMESTER V

Course	~ -		~	Hrs		~	
Component	Code	Title of the paper	Credit	/week	ESE	CIA	Total
Como T5	19CCE	Organic Chemistry – I	5	5	75	25	100
CoreT-6	19CCF	Physical Chemistry – I	5	5	75	25	100
Core T-7	19CCG	Pharmaceutical Chemistry	5	5	75	25	100
Core Practical-3	19CC3	Gravimetric &Organic Analysis Practical	-	4	-	-	-
Core Practical-4	19CC4	Physical Chemistry practical	-	3	-	-	-
Core Elect- 1 (Any one)	19ECA	Analytical Chemistry	4	4	75	25	100
	19ECB	Material Chemistry	4	4	75	25	100
	19ECC	Chemistry of Consumer Products	4	4	75	25	100

SEMESTER VI

Course Component	Code	Title of the paper	Credit	Hrs /week	ESE	CIA	Total
Core T-8	19CCH	Inorganic Chemistry	5	5	75	25	100
CoreT-9	19CCJ	Organic Chemistry - II	5	5	75	25	100
Core T-10	19CCK	Physical Chemistry – II	5	5	75	25	100
Core Practical-3	19CC3	Gravimetric &Organic Analysis- Practical	6	6	60	40	100
Core Practical-4	19CC4	Physical Chemistry practical	5	3	60	40	100
Core Elect-2 (Any one)	19ECD	Nuclear and Solid State Chemistry	4	4	75	25	100
	19ECE	Food chemistry and Adulteration	4	4	75	25	100
	19ECF	Green Methods in Chemistry	4	4	75	25	100
Core Elect-3 (Any one)	19ECG	Industrial Chemistry	5	5	75	25	100
	19ECH	Basic Clinical and Biomedical Chemistry	5	5	75	25	100
	19ECJ	Nano Chemistry	5	5	75	25	100

BHARATHI WOMEN'S COLLEGE (AUTONOMOUS), CHENNAI - 600108. **B.Sc CHEMISTRY GENERAL CHEMISTRY – I** (For the students admitted from the year 2019-2020)

HOURS PER WEEK : 6 CREDITS: 5

SEMESTER : I SUBJECT CODE : 19CCA

Objectives

- \blacktriangleright To enable the students to acquire knowledge in the theory behind the volumetric analysis, this leads them to develop the knowledge in the principles of concentration, primary and secondary standards.
- > Students can get knowledge of synthesis, reactions, and importance of aliphatic and alicyclic compounds.
- > To study the gas laws, physical properties of liquids and the classification of liquid crystal

INORGANIC CHEMISTRY

UNIT I : PRINCIPLES OF VOLUMETRIC ANALYSIS

General principle: Types of titrations. Requirements for titrimetric analysis. Concentration systems: Molarity, molality formality, normality, wt%, ppm, milli equivalence and millimoles problems.

Primary and secondary standards, criteria for primary standards, preparation of standard solutions, standardization of solutions. Limitation of volumetric analysis, endpoint and equivalence point. Neutralisation-titration curve, theory of indicators, choice of indicators. Use of phenolphthalein and methyl orange- titration involving EDTA.

ORGANIC CHEMISTRY

UNIT II : ALIPHATIC COMPOUNDS

Alkanes – Classification and nomenclature, preparations, physical properties, reactions, reactions with radical mechanism for substitution reaction – cracking.

Alkenes -Classification and nomenclature, preparation from alcohol, haloalkane, dihaloalkanes and alkynes - reactions of alkenes - mechanisms involved in addition of hydrogen, halogen, hydrogen

(**18hrs**)

(18hrs)

halide, hypohalous acid, water, hydroboration, hydroxylation, ozonolysis and epoxidation - peroxide effect - allylic substitution, oxidation by KMnO₄ and polymerization –

Alkynes- Classification of nomenclature, preparation, reactions - addition of hydrogen, halogen, hydrogen halide, water, HCN, CH₃COOH, hydroboration - dimerisation and cyclisation - acidity of terminal alkynes.

UNIT III: ALICYCLIC COMPOUNDS

Cycloalkanes: Preparation (small, medium & large ring compounds) - reactions - cycloaddition, dehalogenation, pyrolysis of calcium salt of dicarboxylic acid - Wurtz reaction - stability of cycloalkanes - Baeyer's strain theory.

Cycloalkenes: Preparation and reactions of cycloalkenes.

AROMATIC COMPOUNDS

Aromaticity - definition - Huckel's rule - consequence of aromaticity - stability, carbon-carbon bond lengths in benzene ring, resonance energy.

Aromatic electrophilic substitution - mechanism of nitration, halogenation, sulphonation, mercuration and Friedel-Crafts reaction - Activating and deactivating substituents - orientation in mono substituted benzenes - reactions of aromatic side chain - halogenation and oxidation.

PHYSICAL CHEMISTRY

UNIT IV: GASEOUS STATE

Ideal gas: Kinetic theory of gases - derivation of gas laws – Maxwells distribution of molecular velocities - Types of molecular velocities - Expansivity and compressibility – collision diameter – collision frequency – mean free path. Behaviour of real gas – Vander Waals equation of state – Boyle temperature –critical constants of gas.

Liquid state: Physical properties – vapour pressure – Trouton's rule – surface tension – Effect of temperature on surface tension – viscocity – effect of pressure and temperature – refraction – refractive index – specific and molar refraction.

UNIT V: COLLOIDAL STATE

Emulsion – classification – preparation, properties and application. Gels - preparation, properties, Donnan membrane equilibrium – applications.

Properties of colloids – electrical property – coagulation – gold number.

(18hrs)

(18hrs)

(18hrs)

Adsorption

Physical and chemical adsorption isotherms – types of adsorption isotherm – Freundlich adsorption isotherm – derivation of Langmuir's adsorption isotherm – BET isotherm (postulates only) BET equation.(statement). Applications of adsorption.

Books for Study:

- 1. Puri, Sharma and kalia, Principles of Inorganic chemistry, Milestone, 2011.
- R. T. Morrison, R. N. Boyd and S.K.Bhattacharjee, Organic chemistry, 7thedn, Pearson Education Asia, 2010.
- 3. Puri, Sharma and Pathania, Principles of physical chemistry, Vishal Pub., 2012.

Books for Reference:

Inorganic chemistry

- 1. Gopalan, Text book of Inorganic chemistry, University Press, 2012.
- 2. B.L. Agarwal and S.K. Agarwal, Text book of Inorganic chemistry
- 3. P.L. Soni, S. Chand, Text book of Inorganic chemistry, 20th edition, 2003.
- A.I. Vogel, A Textbook of Quantitative Inorganic Analysis, ELBS and Longman London, 1975.
- 5. S.M. Khopkar, Basic Concepts of Analytical Chemistry New Age International Publisher, 2009.
- W. U. Malik, G. D. Tuli, and R. D. Madan: Selected Topic in Inorganic Chemistry, S. Chand & Company Ltd, New Delhi, 1998.
- P. L. Soni, Mohan Katyal, Text book of Inorganic Chemistry, 20th Edition, Sultan Chand & Sons, New Delhi, 2007.
- 8. R.D.Madan, "Advanced Inorganic Chemistry"

Organic chemistry

- F. A. Carey and R. J. Sundberg, Advanced Organic Chemistry, Part A and B, 5thedn, Springer Publishers, 2008.
- 2. L. Finar, Organic Chemistry Vol-1& 2, 6thedn, Pearson Education Asia, 2004.
- 3. P. Y.Bruice, Organic Chemistry, Vol-1 & 2, 7thedn, Pearson Education Asia, 2012.
- 4. J.Clayden, N. Greeves, S. Warren, Organic Chemistry, 2ndedn, Oxford, 2012.

- K.S. Tewari, S.N. Mehrotra and N.K. Vishnoi, A Text book of organic chemistry, Vikas Publishing house Pvt. Ltd., 3rd edition, 2009.
- P. L. Soni and H. M. Chawla, S. Chand, Text book of Organic chemistry 28th revised edition, 2001.
- 7. B.S. Bahl and Arun Bahl, S. Chand, Text book of Organic chemistry, 2005.
- 8. C.N. Pillai, Organic chemistry, University press, 2008.

Physical chemistry

- 1. N. Kundu and S.K. Jain, Physical Chemistry, S. Chand & Company Ltd. 2000
- 2. G.M.Barrow, Physical Chemistry, 6th edn, McGraw-Hill Inc., US, 1996.
- 3. P.L. Soni and O.P. Dharmarha, S. Chand, 7th edition, 1973.

Website

- 1. https://chem.libretexts.org
- 2. <u>www.chem1.com</u>
- 3. <u>https://open.umn.edu</u>
- 4. https://learn.saylor.org

- They know the theory behind the volumetric analysis, which gives the information about the concentration, and Primary & Secondary standards.
- Students gain knowledge on the preparation, properties and reactions of aliphatic compounds.
- Students can get knowledge of synthesis, reactions, and importance of alicyclic compounds.
- Students can learn about the behavior of gases and liquids and can solve the problems regarding molecular velocities.

BHARATHI WOMEN'S COLLEGE (AUTONOMOUS), CHENNAI –600108. B.Sc CHEMISTRY GENERAL CHEMISTRY II (For the students admitted from the year 2019-2020)

HOURS PER WEEK : 6 CREDITS : 5 SEMESTER : II SUBJECT CODE : 19CCB

(90 Hrs)

Objective

- > To learn the shape of atomic orbitals and various type of quantum numbers
- > To learn the periodic properties of elements and its classifications
- ➤ To learn the preparation, properties and importance of aliphatic hydrocarbons.
- \blacktriangleright To learn the various atomic models
- > To understand the quantum theory and wave mechanical concept
- To learn the shapes of orbital.

INORGANIC CHEMISTRY

UNIT I : PERIODIC PROPERTIES

Periodic properties – classification of elements as s, p, d and f-block elements – variation of atomic volume – atomic and ionic radii – ionization potential – electron affinity and electro negativity along period and groups – variation of metallic characters - Factors affecting the periodic properties. Periodic table anomalies and variations in atomic radius, ionic radius, electronic configuration, , electron affinity and electro negativity, ionization energy and metallic character of elements along the group and periods and their influences on stability, colour, coordination number, geometry.

ORGANIC CHEMISTRY

UNIT II : ALIPHATIC COMPOUNDS

Ethers: Nomenclature and general methods of preparation – dehydration of alcohols – Williamson's synthesis from halogenated ethers and Grignard reagents, properties and reactions. Grignard reagents: laboratory preparation – structure – properties – synthetic uses.

(**18hrs**)

(18hrs)

Alcohols: Nomenclature and preparation of alcohols through reduction, hydroboration, hydration, oxymercuration and Grignard reaction. Reactions of alcohol - with metals, esterification with mechanism, oxidation, dehydration, conversion to alkyl halides.

UNIT III: AROMATIC ALCOHOLS

Phenols: Nomenclature, physical properties, H- bonding.Preparation of phenols, acidity of phenol vs alcohol, relative acid strength of substituted phenol, reaction of phenol :-Ether formation,Ester formation, Mechanism of ring substitution reaction- Nitration, Sulphonation, Halogenation, Oxidation, Kolbe's reaction, Riemer Tiemann reaction, Gattermann reaction.

PHYSICAL CHEMISTRY

UNIT IV: ATOMIC STRUCTURE

Atomic orbitals - Quantum numbers- Principal, Azimuthal, Magnetic and Spin quantum numbers and their significance – principles governing the occupancy of electrons in various quantum levels-Pauli's exclusion principle – Hund's rule- Aufbau Principle, (n+1) rule. inert pair effect.

Shapes of s, p, d and f orbitals. Contour boundary and probability diagrams. Stability of halffilled and completely filled orbitals.

Planck's quantum theory - Photoelectric effect, Compton effect, Bohr's model of hydrogen atom (no derivation), Wave particle duality, de Broglie equation, Heisenberg uncertainty principle -Eigen function and Eigen value.

UNIT V : SOLUTIONS AND COLLIGATIVE PROPERTIES

Thermodynamics of ideal solutions: Ideal solutions and Raoult's law, deviations from Raoult's law – non-ideal solutions. Vapour pressure-composition and temperature composition curves of ideal and non-ideal solutions. Distillation of solutions. Lever rule. Azeotropes. Partial miscibility of liquids: Critical solution temperature; effect of impurity on partial miscibility of liquids. Nernst distribution law and its applications. Colligative properties- elevation of boiling point, depression in freezing point -Abnormal behavior of solutions of electrolytes.

Books for Study:

- Principles of Inorganic chemistry Puri, Sharma and kalia, Milestone, 2011. 1.
- 2. M.K. Jain and S. C. Sharma, Modern Organic Chemistry, Visal Publishing Co, 2015.
- Text book of physical chemistry P.L. Soni and O.P. Dharmarha, S. Chand, 7th edition, 3. 1973.

(18hrs)

(18hrs)

(18hrs)

Books for Reference:

Inorganic chemistry

- 1. Gopalan, Text book of Inorganic chemistry, University Press, 2012.
- 2. B.L. Agarwal and S.K. Agarwal, Text book of Inorganic chemistry.
- 3. P.L. Soni, S. Chand, Text book of Inorganic chemistry 20th edition, 2003.

Organic chemistry

- 1. L. Finar, Organic Chemistry Vol-1& 2, 6thedn, Pearson Education Asia, 2004.
- Bhupinder Mehta and Manju Mehta, Organic Chemistry, 2nd edition, PHI Learning Pvt Ltd, 2015.
- K.S. Tewari, S.N. Mehrotra and N.K. Vishnoi, A Text book of organic chemistry. Vikas Publishing house Pvt. Ltd., 3rd edition, 2009.
- P.L.Soni and H. M. Chawla, S. Chand, Text book of Organic chemistry –28th revised edition, 2001.
- 5. B.S. Bahl and Arun Bahl, S. Chand, Text book of Organic chemistry –2005.
- 6. C.N. Pillai, Organic chemistry University press.

Physical chemistry

- 1. Bahl and Arun Bahl, Essentials of Physical chemistry –S. Chand, 2011.
- 2. Puri, Sharma and Pathania, Principles of physical chemistry –Vishal Pub., 2012

Website

- 1. <u>https://chem.libretexts.org</u>
- 2. <u>www.chem1.com</u>
- 3. https://open.umn.edu
- 4. <u>https://learn.saylor.org</u>

- Understand how the concept of electro negativity and its variation over the periodic table can be used to rationalize the nature of the bonding in substances.
- Students gain knowledge on the preparation, properties and reactions of aliphatic compounds.

- The reactions of Alcohol with mechanisms can be well understood and applied in the synthesis of compounds mentioned and many other important alcohol related compounds in industrial and medicinal fields.
- Gain knowledge about various quantum numbers and occupancy of electrons on various quantum levels
- Students can gain knowledge about atomic models and basic concept of Quantum theory.
- Gives an explanation about ideal and non-ideal solutions and its applications ii) Interprets the relationship between vapour pressure and colligative properties.

BHARATHI WOMEN'S COLLEGE (AUTONOMOUS), CHENNAI –600108. B.Sc CHEMISTRY GENERAL CHEMISTRY – III (For the students admitted from the year 2019-2020)

HOURS PER WEEK :5 CREDITS : 5 SEMESTER : III SUBJECT CODE : 19CCC

(75Hrs)

Objective

- To understand the nature of covalent and ionic bonds, To understand the principles and theories of chemical bonding, To learn the hybridization and shapes of simple inorganic molecules
- > To understand aliphatic and aromatic sulphur compounds.
- To study the second law of thermodynamics, the concept of entropy, concept of Gibbs Free energy and their applications.

UNIT I : CHEMICAL BONDING

Ionic bond – Properties of ionic compounds, factors favoring the ionic compounds ionization potential – electron affinity – electronegativity – Lattice energy – Born-Haber Cycle – Pauling and Mulliken's scales of electronegativity – Polarizing power and Polarizability – Partial ionic character from electronegativity. Transition from ionic to covalent character and vice versa.

Covalent character of ionic compounds – Fajan's rules – Covalent bond – structure and bonding of homo and heteronuclear molecules – Hydrogen bonding – Its nature, types, effect on properties –

VSEPR Theory – Principles and hybridization- Shapes of simple inorganic molecules (BeCl₂, BF₃, SiCl₄, PCl₅, SF₆, IF₇,H₂O, NH₃, XeF₆).

MO Theory –Bonding and anti-bonding orbitals – Applications of MO theory H₂, He, N₂, O₂, HF and CO molecules – Comparison of VB and MO Theories.

ORGANIC CHEMISTRY

UNIT-II: ALIPHATIC SULPHUR COMPOUNDS

Thio alcohols and thioethers-Methods of preparation, properties and reactions, musard gas, sulphoxides and sulphones.

Aromatic sulphur compounds: Methods of preparation properties and reactions of benzene sulphonic acid, Sulphonyl chloride, sulphonamide, saccharin, chloramine-T, sulphanilic acid.

ALIPHATIC ALDEHYDES AND KETONES

General methods of preparation - oxidation of alcohols from acids, Rosenmund reaction, Grignard reagent, aceto acetic ester-properties-reactivity of carbonyl group nucleophilic addition to carbonyl group, oxidation, reduction reactions given only by aldehyde and ketones - mechanism of aldol condensation, Claisen condensation, Schmidt and Cannizaro reactions. Pinacol-Pinacolone rearrangements.

Individual members: Formaldehyde, acetaldehyde, acetone, unsaturated aldehydes and ketones – acraldehyde, Methy vinyl ketone - methods of preparation and reactions.

UNIT-III : AROMATIC ALDEHYDES AND KETONE

Common methods for the synthesis of aldehydes and ketones - synthesis of aldehydes from acid chlorides, Stephen's reduction - Gattermann-Kosch and Etard reactions.

Synthesis of ketones from nitriles, dialkylcadmium, alkyl lithium and lithium dialkylcuprate and Friedel-Crafts and Hoesch reactions.

Mechanism of nucleophillic additions to carbonyl group - addition of HCN, alcohols, thiols, sodium bisulfite, Grignard reagents -condensation with ammonia and its derivatives - Aldol, Perkin, Benzoin and Knoevenagel condensations, Wittig reaction, Mannich reaction, Reformatsky reaction and Cannizaro reaction. Oxidation by Tollen's reagent, KMnO₄, Reduction by H₂/Ni, NaBH₄, LiAlH₄, MPV, Clemmenson and Wolff-Kischner reductions. Unsaturated aldehyde- cinnamaldehyde-preparation, properties and reactions.

PHYSICAL CHEMISTRY

UNIT IV : THERMODYNAMICS – I

System-surrounding-Intensive and extensive variables; state and path functions; isolated, closed and open systems-zeroth law of thermodynamics. First law of thermodynamics-mathematical form- Heat capacity. Relation between C_P and C_V . Isothermal process: Calculations of w, q, dE and dH for the reversible expansion of ideal gases under isothermal and adiabatic conditions.

(15hrs)

(15hrs)

Joule- Thomson effect-derivation of Joule- Thomson coefficient for ideal gases and real gases, inversion temperatures. Variation of enthalpy change of reaction with temperature (Kirchoff's equation). Hess's law of constant heat of summation.Bond energy and its calculations.

UNIT V: PHOTOCHEMISTRY

(15hrs)

Laws of photochemistry - Grothus-Drapper law – Stark-Einstein law of photochemical equivalence – Quantum efficiency – determination of quantum efficiency – chemical actinometry – consequence of light absorption – Jablonski diagram – radiative and non-radiative transitions.

Photochemical reactions – kinetics of photochemical combination of H_2 - Cl_2 , H_2 - Br_2 and decomposition of HI – Energy transfer in photochemical reactions – photosensitization - photosynthesis in plants – Theory of Fluorescence and Phosphorescence – Chemiluminescence and bioluminescence.

Books for Study:

- 1. Puri, Sharma and kalia, Principles of Inorganic chemistry –Milestone, 2011.
- P.L.Soni and H. M. Chawla, S. Chand, Text book of Organic chemistry –28th revised edition, 2001.
- 3. Bahl and Arun Bahl, S. Chand, Essentials of Physical chemistry –2011.

Books for Reference:

Inorganic chemistry

- 1. Gopalan, Text book of Inorganic chemistry –University Press, 2012.
- 2. B.L. Agarwal and S.K. Agarwal, Text book of Inorganic chemistry.
- 3. P.L. Soni, S. Chand, Text book of Inorganic chemistry –20th edition, 2003.

Organic chemistry

- K.S. Tewari, S.N. Mehrotra and N.K. Vishnoi A Text book of organic chemistry Vikas Publishing house Pvt. Ltd., 3rd edition, 2009.
- 2. Text book of Organic chemistry B.S. Bahl and Arun Bahl, S. Chand, 2005.
- 3. C.N. Pillai Organic chemistry –University press.

Physical chemistry

- 1.P.L. Soni and O.P. Dharmarha, S. Chand, Text book of physical chemistry –7th edition, 1973.
- 2. Puri, Sharma and Pathania, Principles of physical chemistry –Vishal Pub., 2012

Website

- 1. <u>https://chem.libretexts.org</u>
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- 3. https://open.umn.edu
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- Students gain knowledge about the common themes running through ionic and covalentchemical bonding.
- > Get idea behind the structure and bond type of simple inorganic molecules.
- Students can derive an easy and elegance way of giving methods of synthesis of aldehydes/ ketones/ carboxylic acids, mechanism of nucleophilic reactions and oxidation-reduction reactions
- Students can acquire knowledge about second and third law of thermodynamics
- Gain knowledge about photochemical reactions.

BHARATHI WOMEN'S COLLEGE (AUTONOMOUS), CHENNAI – 600108. B.Sc CHEMISTRY ALLIED CHEMISTRY-I (For the students admitted from the year 2019-2020)

HOURS PER WEEK : 3 CREDITS : 3

SEMESTER: III SUBJECT CODE : 19ACB

(45Hrs)

Objectives

- This paper aims to impart a basic knowledge on chemical bonding, hydrides, covalent bond, metallurgy, photochemistry and dyes.
- ➢ In addition, the basic principles of various chromatographic techniques and also about instrumentation in chromatography are highlighted.

UNIT I: CHEMICAL BONDING

Molecular Orbital Theory, bonding, anti-bonding and non-bonding orbitals. M.O configuration

of H₂, He, N₂, O₂ & F₂. Bond orders, Diamagnetism and Paramagnetism.

Hydrides: Classification – preparation. Diborane-Preparation, properties and structure. Preparation and uses of NaBH₄ and borazole.

UNIT II: METALLURGY

General methods of extraction of metals, types of ores- Ore dressing – types of furnaces, reduction methods, electrical methods – types of refining – van Arkel – zone refining – extraction of Cu and U. Role of carbon in steel – heat treatment of steel.

UNIT III : COVALENT BOND

Orbital Overlap, hybridization, geometry of organic molecules- CH₄, C₂H₄, C₂H₂, C₆H₆. VSEPR theory. Polar effects in organic molecules- Inductive, electromeric, mesomeric, hyperconjugation and steric effect.

UNIT IV: DYES

Classification of dyes, preparation and uses of methyl orange, indigo and malachite green Vitamins and Hormones: Diseases caused by deficiency of vitamins A, B₁, B₂, C and D. Sources of these vitamins.

Peptide hormones- oxytoxin, protein hormones- insulin- their biological functions.

(9hrs)

(9hrs)

(9hrs)

(9hrs)

UNIT V : PHOTOCHEMISTRY

Laws of photochemistry - Grothus-Draper's Law, Stark-Einstein Law, quantum yield - H2 - Cl2

reaction – photosynthesis – phosphorescence – fluorescence – chemiluminescence.

CHOMOTOGRAPHY:

Principle ,methods and application of Column, Paper and Thin layer Chromotography

Books for Study:

- 1. Principles of Inorganic chemistry Puri, Sharma and kalia, Milestone, 2011.
- 2. Text book of Organic chemistry P.L.Soni and H. M. Chawla, S. Chand, 28th revised edition, 2001.
- 3. Essentials of Physical chemistry Bahl and Arun Bahl, S. Chand, 2011.

Books for Reference:

Inorganic chemistry

- 1. Text book of Inorganic chemistry Gopalan, University Press, 2012.
- 2. Text book of Inorganic chemistry B.L. Agarwal and S.K. Agarwal.
- 3. Text book of Inorganic chemistry P.L. Soni, S. Chand, 20th edition, 2003.

Organic chemistry

- 1. A Text book of organic chemistry K.S. Tewari, S.N. Mehrotra and N.K. Vishnoi, Vikas Publishing house Pvt. Ltd., 3rd edition, 2009.
- 2. Text book of Organic chemistry B.S. Bahl and Arun Bahl, S. Chand, 2005.
- 3. Organic chemistry C.N. Pillai University press.

Physical chemistry

- 1. Text book of physical chemistry P.L. Soni and O.P. Dharmarha, S. Chand, 7th edition, 1973.
- 2. Principles of physical chemistry Puri, Sharma and Pathania, Vishal Pub., 2012.

Website

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- 2. www.chem1.com
- 3. https://open.umn.edu
- 4. https://learn.saylor.org

- Students gain knowledge about the common themes running through ionic and covalent chemical bonding.
- > Get idea behind the structure and bond type of simple inorganic molecules.
- Students can derive an easy and elegance way of giving methods of synthesis of aldehydes/ketones/carboxylic acids, mechanism of nucleophilic reactions and oxidationreduction reactions
- Gain knowledge about photochemical reactions.

BHARATHI WOMEN'S COLLEGE (AUTONOMOUS), CHENNAI – 600108. B.Sc CHEMISTRY NON-MAJOR ELECTIVE I POLYMER CHEMISTRY (For the students admitted from the year 2019-2020)

HOURS PER WEEK : 2	SEMESTER : III
CREDITS: 2	SUBJECT CODE : 19NCA

30 Hrs)

Objective

> To make the non major student to easily understand the types of polymers, methods of polymerisation, plastics and rubber.

UNIT I: (7hrs)
Polymers - Distinction among plastics, elastomers and fibers. Nomenclature of polymers -
Homo, hetero, linear, branched, cross linked, block and graft co-polymers.
UNIT II : (8hrs)
Thermoplastics and thermosetting plastics . Types of polymerisation- addition
(Polyethylene, Polyvinyl chloride) condensation (Nylon-6,6) and co- polymerisation. (polybutadiene-
co-styrene)
UNIT III : (8hrs)
Bulk, suspension, emulsion and solution polymerization. Synthesis, properties and applications
of the following : Bakelite and polyurethanes.
UNIT IV: (7hrs)
Natural rubber- vulcanization, synthetic rubber- styrene rubber and neoprene. Biomedical
applications of polymers.
Book for Study:
1. Text book of Polymer science – P. Bahadur & N.V. Sastry, Alpha Science International,
2005.
Book for Reference:
2. Polymer chemistry – Arora and Singh, Anmol publications, 2002.

3. Engineering chemistry – Jain and Jain, Dhanpat Rai publishers, 2013.

Website

- 1. https://chem.libretexts.org
- 2. https://britannica.com
- 3. www.sakshieducation.com
- 4. <u>www.nkpatel.co.in</u>

- Able to isolate the key design features of a product which relates directly to the materials
- > Indicate how the properties of polymeric materials can be exploited by product designer
- Identify the repeat units of particular polymers and specify the isomeric structures which can exist for those repeat units

BHARATHI WOMEN'S COLLEGE (AUTONOMOUS), CHENNAI –600108. B.Sc CHEMISTRY GENERAL CHEMISTRY – IV (For the students admitted from the year 2019-2020)

HOURS PER WEEK : 5 CREDITS : 5

SEMESTER : IV SUBJECT CODE : 19CCD

(75Hrs)

Objective

- > To provide the detailed chemistry about halogen family and noble gases
- To study about the basic concepts, characteristic features, preparation and reaction of heterocyclic compounds.
- To understand clearly about the classification and structural features of Carbohydrates.
- To study the second law of thermodynamics, the concept of entropy, concept of Gibbs Free energy and their applications.

INORGANIC CHEMISTRY

UNIT I : HALOGEN FAMILY AND NOBLE GASES

General characteristics of halogen with reference of electro negativity, electron affinity, oxidation states, and oxidizing power – peculiarities of fluorine, Hydrides, oxides and oxo acids of halogens

Interhalogen compounds – polyhalide ions – pseudohalogens – preparation, properties and structure of interhalogen compounds

Inert gases – position in the periodic table – isolation from atmosphere – General characteristics – Structure and shape of xenon compounds – XeF₂,XeF₄, XeF₆, XeOF₂, XeOF₄ – uses of noble gases.

ORGANIC CHEMISTRY

UNIT II : HETEROCYCLIC COMPOUNDS

Molecular orbital picture and aromatic characteristics of pyrrole, furan, thiophene and pyridine - Comparison between basicity of pyridine, piperidine and pyrrole. Methods of synthesis and

(15hrs)

chemical reactions with particular emphasis on the mechanism of electrophilic substitution and mechanism of nucleophilic substitution reaction in pyridine derivatives.

Preparation and reactions of indole, quinoline and isoquinoline with special reference to Fisher indole synthesis, Skraup synthesis and Bischler-Napieralski synthesis, mechanism of electrophilc substitution reactions of indole, quinoline and isoquinoline.

UNIT III :CARBOHYDRATES

Carbohydrates: Definition - Classification with suitable examples - Classification of sugars as reducing and nonreducing sugars - Stereochemistry of carbohydrates: D- and L- configurations - Erythro and threo diastereomers - Anomers and epimers with suitable examples.

Monosaccharides: Classification of monosaccharides with suitable examples – Glucose - properties of glucose - Epimerisation of glucose - Anomers of glucose and mutarotation - Fructose and its properties - Conversion glucose into fructose and vice-versa - Formation of osazone and glycosides - Fischer open structure and evidences for open structure - Haworth projection cyclic structures (pyranose and furanose) and evidences for cyclic strucures of glucose and fructose - Stepping up - Kiliani- Fischer synthesis and stepping down - Ruff degradation of monosaccharides.

PHYSICAL CHEMISTRY

UNIT IV: THERMODYNAMICS-II

Second law of thermodynamics – Need for second law – statements of Second law - Carnot theorem, Carnot cycle – Efficiency of heat engine. Concept of entropy – State function – entropy change in isothermal expansion of ideal gas - Entropy change in reversible and irreversible process – Entropy change accompanying by change of phase – calculation of entropy change of an ideal gas with changes in pressure, volume and temperature – Entropy of mixing – Physical significance of entropy.

UNIT V : THERMODYNAMICS- III

Gibbs and Helmholtz free energy G and A, Variation of G and A with temperature, pressure, free energy change. Criterion for spontaneity, Maxwells relationships. Thermodynamic equations of state. Gibbs-Helmholtz equation.

Clausius-Clapeyron equation-applications. Nernst heat theorem. Third law of thermodynamics evaluation of absolute entropy from heat capacity measurements. Tests for III law. Exception to III law.

Books for Study:

1. Principles of Inorganic chemistry – Puri, Sharma and kalia, Milestone, 2011.

2. Text book of Organic chemistry - P.L.Soni and H. M. Chawla, S. Chand, 28th revised edition,

(15hrs)

(15hrs)

2001.

3. Essentials of Physical chemistry – Bahl and Arun Bahl, S. Chand, 2011.

Books for Reference

Inorganic chemistry

- 1. Gopalan, Text book of Inorganic chemistry –University Press, 2012.
- 2. B.L. Agarwal and S.K. Agarwal, Text book of Inorganic chemistry.
- 3. P.L. Soni, S. Chand, Text book of Inorganic chemistry –20th edition, 2003.

Organic chemistry

- K.S. Tewari, S.N. Mehrotra and N.K. Vishnoi, A Text book of organic chemistry –Vikas Publishing house Pvt. Ltd., 3rd edition, 2009.
- 2. B.S. Bahl and Arun Bahl, S. Chand, Text book of Organic chemistry -2005.
- 3. C.N. Pillai , Organic chemistry University press.

Physical chemistry

- 1. P.L. Soni and O.P. Dharmarha, S. Chand, Text book of physical chemistry –7th edition, 1973.
- 2. Puri, Sharma and Pathania, Principles of physical chemistry –Vishal Pub., 2012.

Website

- 1. <u>https://chem.libretexts.org</u>
- 2. <u>www.chem1.com</u>
- 3. https://open.umn.edu
- 4. <u>https://learn.saylor.org</u>

- > It may give a clear knowledge about halogen family, noble gases and their applications.
- It brings an idea of the synthesis, reactions, applications and important features of heterocyclic compounds.
- Students can able to notify different types of carbohydrates and its structural properties
- Students can acquire knowledge about second and third law of thermodynamics

BHARATHI WOMEN'S COLLEGE (AUTONOMOUS), CHENNAI – 600108. B.Sc CHEMISTRY NON-MAJOR ELECTIVE – II AGRICULTURAL CHEMISTRY (For the students admitted from the year 2019-2020)

HOURS PER	WEEK:2
CREDITS :	2

SEMESTER : IV SUBJECT CODE : 19NCB

(**30Hrs**)

Objectives

This paper enables a non major student to understand the basic concepts on soil chemistry, fertilizers, manures, pesticides, insecticides, fungicides and herbicides.

UNIT I: SOIL CHEMISTRY

Introduction - soil c lassification - properties of soils - soil texture- soil water - soil temperature - soil minerals - soil pH - Acidity and alkalinity - buffering soils.

UNIT II: FERTILIZERS

Classification of fertilizers: Nitrogen fertilizers - urea. Phosphate fertilizers - super phosphate of lime. Potash fertilizers – Potassium nitrate.

UNIT III : MANURES, COMPOST AND SAW DUST

Farmyard manures, compost, green manure - crops, saw dust, sludge, Gober gas.

UNITIV: PESTICIDES, INSECTICIDES, FUNGICIDES & HERBICIDES (7hrs)

Introduction. Classification - some important herbicides - PCP, TCA. Rodenticides-sodium fluoro acetate, α -napthyl urea. Insecticides - DDT, BHC - Fungicides - Bordeaux mixture. Benefit of pesticides- adverse environmental effects of pesticides.

Books for Study:

 Erach Bharucha, Text book of Environmental chemistry UG course, University Press (India) Pvt., Ltd., 2005.

Books for Reference:

- 1. Jayashree Ghosh. S. Chand and Co, Fundamental concept Applied chemistry, Ltd., 2006.
- 2. Industrial chemistry , B.K. Sharma, Krishna Educational Pub., 16th edition, 2014.

Website

(8hrs)

(8hrs)

(7hrs)

- 1. https://www.internetchemistry.com
- 2. https://www.bfitdoon.com
- 3. https://www.sciencedirect.com
- 4. https://www.chemistryexplained.com

- Goals of agricultural chemistry are to expand understanding of the causes and effect of bio-chemical reactions related to plant and animal growth, to reveal opportunities for controlling those reactions and to develop chemical products that will provide.
- Aims at preserving and increasing the fertility of soil, maintaining and improving agricultural yield and improving the quality of crops.

BHARATHI WOMEN'S COLLEGE (AUTONOMOUS), CHENNAI –600108. B.Sc CHEMISTRY ALLIED CHEMISTRY-II (For the students admitted from the year 2019-2020)

HOURS PER WEEK : 3 CREDITS : 3 SEMESTER: IV SUBJECT CODE : 19ACB

(45hrs)

(9hrs)

(9hrs)

Objectives

- The objective of this unit is to expose the students about the basic concepts of coordination compound
- This paper aims to elaborate the varied applications of chemistry in industries.

UNIT I : CO-ORDINATION CHEMISTRY

Nomenclature – theories of Werner, Sidwick and Pauling. Chelation- Haemoglobin, Chlorophyll, EDTA – applications in qualitative and quantitative analysis.

UNIT II : INDUSTRIAL CHEMISTRY

Synthesis, properties and uses of silicones. Fuel gases: composition and properties of natural gas, water gas, semi water gas, carburetted water gas, producer gas, oil gas, LPG and Gobar gas. (manufacturing details not required.)

FERTILIZERS: Preparation and uses of urea, ammonium sulphate, ammonium nitrate, potassium nitrate, and triple superphosphate.

Environmental chemistry: Pollution of air, water and soil- sources and remedies.

UNIT III : AROMATIC COMPOUNDS

Electrophilic substitution reaction in benzene- nitration, halogenation, alkylation, acylation and sulphonation with mechanism.

Isolation, preparation, properties and structural elucidation of naphthalene.

UNIT IV : CARBOHYDRATES

Classification, preparation and properties of glucose and fructose- open chain and ring structure of glucose. Conversion of glucose into fructose and vice-versa.

(9hrs)

(9hrs)

AMINO ACIDS: Classification, preparation and properties of α -amino acids. Peptide synthesis, classification of proteins by physical properties and biological functions.

(9hrs)

UNIT V : ELECTROCHEMISTRY

 $Ionic\ equilibra-strong\ and\ weak\ electrolyte-common\ ion\ effect-pH-buffer\ solution\ and\ buffer\ action-buffers\ in\ biological\ systems.$

Phase rule: Definition of terms –one component system(water system) ,two component system(Pb-Ag system)

Books for Study:

- 1. Puri, Sharma and kalia, Principles of Inorganic chemistry, Milestone, 2011.
- P. L.Soni and H. M. Chawla, Text book of Organic chemistry, S. Chand, 28th revised edition, 2001.
- 3. Bahl and Arun Bahl, Essentials of Physical chemistry, S. Chand, 2011.

Books for Reference:

Inorganic chemistry

- 1. Gopalan, Text book of Inorganic chemistry, University Press, 2012.
- 2. B.L. Agarwal and S.K. Agarwal Text book of Inorganic chemistry.
- 3. P.L. Soni, S, Text book of Inorganic chemistry Chand, 20th edition, 2003.

Organic chemistry

- K.S. Tewari, S.N. Mehrotra and N.K. Vishnoi, A Text book of organic chemistry, Vikas Publishing house Pvt. Ltd., 3rd edition, 2009.
- 2. B.S. Bahl and Arun Bahl, Text book of Organic chemistry, S. Chand, 2005.
- 3. C.N. Pillai, Organic chemistry, University press.

Physical chemistry

- 1. P.L. Soni and O.P. Dharmarha, Text book of physical chemistry, S. Chand, 7th edition, 1973.
- 2. Puri, Sharma and Pathania, Principles of physical chemistry, Vishal Pub., 2012.

Website

- 1. <u>https://chem.libretexts.org</u>
- 2. <u>www.chem1.com</u>
- 3. <u>https://open.umn.edu</u>
- 4. https://learn.saylor.org

- Students can able to notify different types of carbohydrates and its structural properties.
- ➢ Gain basic knowledge in chemistry

BHARATHI WOMEN'S COLLEGE (AUTONOMOUS), CHENNAI - 600108. **B.Sc CHEMISTRY ORGANIC CHEMISTRY – I** (For the students admitted from the year 2019-2020)

HOURS PER WEEK:5 CREDITS: 5

SEMESTER : V **SUBJECT CODE : 19CCE**

(75Hrs)

Objectives:

- To study about (i) hybridization and geometry of organic molecule and (ii) Electronic effects, bonding and its influences.
- \blacktriangleright To know the preparation, properties and applications of N-containing compounds.

UNIT I: BONDING IN ORGANIC MOLECULES

Hybridization and geometry - bond angle, bond length, bond strength of C-H and C-C bonds -Van der Waal's interactions, Inter & Intra molecular forces and their effects on physical properties.

Electronic effects - inductive effect, resonance effect - drawing of resonance structures conditions for resonance - stability of resonance structures, hyper conjugation, electromeric effect, steric effect - steric overcrowding - steric inhibition of resonance - steric relief(with examples)

UNIT II : STEREOCHEMISTRY

Structural isomerism - types with examples - tautomerism - keto-enol, nitro-acinitro, amidoimido. Stereochemistry - Representation of molecules in saw horse, Fischer, flying-wedge and Newman formulae and their inter translations. Symmetry elements - chirality - asymmetric molecules and molecular dissymmetry-pseudo asymmetry.

Optical rotation - specific rotation - optical purity - methods of racemization - Optical isomers enantiomers - diastereomers - epimers - notation of optical isomers - Cahn-Ingold-Prelog rules, R and S

(15hrs)

notations for optical isomers with one and two asymmetric carbon atoms - erythro and threo representations - D and L representations - Optical activity in compounds without asymmetric carbon atoms namely biphenyls, allenes and spiranes - asymmetric synthesis.

Geometrical isomerism – nomenclature of geometrical isomers – cis/trans, E-Z notation and synanti for C=C,C=N compounds - Methods to assign configurations - Stability of geometrical isomers and heats of hydrogenation.

UNIT III : UREA AND ESTERS

(15hrs)

(15hrs)

Esters: preparation – reactions – hydrolysis by acids and bases (with mechanism) – reduction reactions with ammonia, PCl₅, alcoholysis, Claisen condensation, Acetoacetic ester – preparation – reactions and synthetic uses- Alkylated monocarboxylic acids, 4C, 5C- Dicarbnoxylic acids, Ketoni9c acids and Unsaturated acids.

Urea: preparation – reactions – basic nature – biuret reaction- hydrolysis – reaction with nitrous acid, hypobromite, hydrazine, acetylation, pyrolysis – tautomerism. Thiourea - preparation – reactions.

UNIT IV : NITROGEN CONTAINING COMPOUNDS I (15hrs)

Aliphatic nitro compounds: Preparation of nitro methane and nitro ethane – reactions - reduction reaction with nitrous acid, hydrolysis, halogenation, reaction with Grignard reagent, Condensation with aldehyde tautomerism.

Aromatic nitro compounds: Preparation of nitro benzene and TNT - Reduction of nitro benzene - acidic, alkaline, neutral, catalytic and electrolytic conditions.

Aliphatic amines: Reaction of alkyl halides with ammonia and reaction of alcohols with ammonia. General methods of preparation of primary, secondary and tertiary amines. Distinction between primary, secondary and tertiary amines. Basicity of amines.

UNIT V: NITROGEN CONTAINING COMPOUNDS II

Aromatic amines: Aniline – basic nature – preparation – reaction: acylation – carbylamine reaction, reaction with carbonyl chloride, Grignard reagent, aldehyde, carbon-di-sulphide, oxidation, halogenation, nitration, sulphonation, diazotisation and coupling reactions – uses.

Acetanilide – sulphanilic acid – N-methyl aniline – N,N, Dimethyl aniline.

Diazonium salts: Benzene diazonium chloride – preparation and reactions.

Diazo methane: Diazo acetic ester – preparation and reactions.

Books for Study:

1. K.S. Tewari, S.N. Mehrotra and N.K. Vishnoi, A Text book of organic chemistry-Vikas

Publishing house Pvt. Ltd., 3rd edition, 2009.

2. P.L.Soni and H. M. Chawla, Text book of Organic chemistry –S. Chand, 28th revised edition, 2011.

Books for Reference:

- 1. B.S. Bahl and Arun Bahl, Text book of Organic chemistry –S. Chand, 2005.
- 2. C.N. Pillai, Organic chemistry University press.
- 3. S. M. Mukherji and S.P. Singh, Reaction Mechanism in Organic chemistry –MacMillan Pub.
- 4. O.P. Agarwal Text book of organic chemistry.
- 5. R. T. Morrison and R. N. Boyd, Organic Chemistry, 6th edition, prentice hall, 1992.
- 6. I. L. Finar, Organic Chemistry Vol-1, 6th edn, Pearson Education Asia, 2004.
- F A Carey and R J Sundberg, Advanced Organic Chemistry, Part A: Structure and Mechanisms, 5th edition, Springer, 2007.

Website

- 1. https://www.simple.m.wikipedia.com
- 2. https://www.sciencedirect.com
- 3. https://www.chemistrylibretexts.org

- Students can gain the knowledge on hybridization and geometry of organic molecule and Electronic effects, bonding and its influences on organic molecules.
- Students gain knowledge about the common themes running through ionic and covalent chemical bonding.
- > Get idea behind the structure and bond type of simple inorganic molecules.
- Study of the relative spatial arrangement of atoms that form the structure of molecules and their manipulation.
- Students study the relationship between different molecules that are made up from the same atoms.
- Students can get the knowledge on preparation, properties and applications of N-containing compounds

BHARATHI WOMEN'S COLLEGE (AUTONOMOUS), CHENNAI –600108. B.Sc CHEMISTRY PHYSICAL CHEMISTRY – I (For the students admitted from the year 2019-2020)

HOURS PER WEEK : 5 CREDITS : 5 SEMESTER : V SUBJECT CODE : 19CCF

(75Hrs)

Objectives:

- To understand Phase rule and its application to various systems
- > To use Clausius Clapeyron equations for the various phase transitions
- > To promote interest in chemical kinetics.
- To impart the concepts in chemical equilibrium, phase equilibria and also to understand chemical potential with derivations and related problems.

UNIT I : PHASE EQUILIBRIA

Phase Rule: Concepts of phase, component and degrees of freedom, with examples. Gibb's phase rule – derivation. One-component system: Phase diagrams: Water and sulphur systems. Two component system: (i) Simple eutectic: Lead-silver and Bi-Cd systems- Formation of compound with congruent (Mg – Zn) and incongruent melting points (Na-K) and salt hydrates(KI- H₂O, FeCl₃- H₂O). Freezing mixtures, partially miscible liquids, CST, effect of impurities on CST.

Clausius - Clapeyron equations and their applications to equilibria in phase transitions. (solid – liquid, liquid – vapour, solid – vapour).

UNIT II : CATALYSIS

Catalysis- characteristics- - different types-homogeneous-heterogeneous-acid-base catalysis-auto catalysis-theories of catalysis-intermediate compound formation theory and adsorption theory.

Kinetics of enzyme catalysis - MichaelisMenton equation. - applications of catalysis.

UNIT III : CHEMICAL EQUILIBRIUM

Thermodynamic derivation of law of equilibrium – free energy and chemical equilibrium – standard free energy change – reaction isotherm – standard free energy change and equilibrium constant

(15hrs)

(15hrs)

of a reaction – degree of advancement of a reaction – variation of equilibrium constant with temperature – Vant-Hoff equation – effect of pressure on equilibrium constant.

Le-Chatlier principle- applications- Haber's process for the synthesis of NH₃ and Contact process for the synthesis of SO₃.

UNIT IV : CHEMICAL KINETICS I

Definition of order and molecularity – rate of reaction - derivation of rate constant of a first, second and zero order reaction (i) When reactants are taken at same initial concentration (ii) When reactants are taken at different initial concentration – derivation of third order rate constant when the reactants are taken at same initial concentration – derivation of half-life period.

Effect of temperature on reaction rate – Arrhenius equation – concept of activation energy. Experimental methods of studying kinetics – volumetry, manometry, polarimetry, colorimetry, dilatometry.

UNIT V : CHE MICAL KINETICS II

Collision theory – derivation of rate constant of a bimolecular reaction – failures of CT – Lindemann theory of unimolecular reaction.

Theory of absolute reaction rate – derivation of rate constant of a bimolecular reaction – comparison between ARRT and CT – Significance of free energy of activation and entropy of activation.

Books for Study:

- **1.** P.L.Soni, Text book of physical chemistry, Sulthan Chand, 2014.
- 2. Glasstone and Lewis Elements of physical chemistry –Macmillan, 1970.
- **3.** P.W.Atkins, Physical chemistry, Oxford univ. press, 9th edition, 2009.

Books for Reference:

- 1. Maron & Prutton, Physical chemistry, Macmilan, 1953.
- 2. Kundu and Jain Sulthan Chand, Physical chemistry –1984.
- 3. S. Glasstone Text book of physical chemistry Macmillan, 1948.
- 4. G.W. Castellan Physical chemistry Narosa publishing house, 2004.
- 5. Walter. J. Moore Physical chemistry Orient Longman, 1999.
- 6. Amalendu Ghoshal, Numerical problems on physical chemistry–Books and Pvt. Ltd., 6th edition, 2013.

(15hrs)

- 7. Gurtu and Gurtu, Phase rule Pragathi prakashan, 1972.
- 8. Harper and Row, Chemical kinetics Laidler, 1987.
- 9. Bahl and Arun Bahl, Essentials of Physical chemistry –S. Chand, 2011.
- 10. Puri, Sharma and Pathania, Principles of physical chemistry –Vishal Pub., 2012.
- 11. N. Kundu and S.K. Jain, Physical Chemistry, S. Chand & Company Ltd. 2000
- 12. G.M.Barrow, Physical Chemistry, 6th edn, McGraw-Hill Inc., US, 1996.
- 13. R.L. Madan, G. D. Tuli, Physical Chemistry, S. Chand, Revised edition, 2014

Website

- 1. www.sakshieducation.com
- 2. <u>https://chem.libretexts.org</u>
- 3. <u>https://pdfdrive.com</u>
- 4. <u>www.goodreads.com</u>

- Brings about the theory of phase rule and its applications to various systems; and to study the Clausius Clapeyron equations.
- > Gain knowledge about the applications of Le-Chatlier principle in industrial processes
- Students can gain knowledge about kinetics and its theories and can solve the problems related to kinetics

BHARATHI WOMEN'S COLLEGE (AUTONOMOUS), CHENNAI – 600108. B.Sc CHEMISTRY PHARMACEUTICAL CHEMISTRY (For the students admitted from the year 2019-2020)

HOURS PER WEEK : 5 CREDITS : 5 SEMESTER : V SUBJECT CODE : 19CCG

(75Hrs)

Objectives

- > To promote the importance of chemistry in pharmacy.
- > To effectively impart a knowledge on Indian medicinal plants.
- To know about the different types of drugs, their functions and mechanism of action.

UNIT I: INTRODUCTION

Importance of chemistry in pharmacy – important terminologies and their meaning – molecular pharmacology, pharmacodynamics, pharmacophore, metabolites, antimetabolites, bacteria, fungi, actinomycetes.

Naming of the drugs: code number, chemicals, proprietary and non-proprietary, trivial names. Storage of drugs – types of drug action –drug delivery systems. Testing of potential of drugs and their side effects.

INDIAN MEDICINAL PLANTS

Indian medicinal plants and trees – Adathoda, Tulsi, Keezhanelli, Grass, Shoe flower, Neem, Mango, Greens, Vallarai and Fig,Thoothvelai.

UNIT II: ANTIBACTERIALS

Sulpha drugs-examples and actions-prontosil, sulphathiazole, sulphafurazole. Antibioticsdefinition and action of penicillin, streptomycin, chloramphenicol, erythromycin-tetracyclin – SAR of chloramphenicol only. Antiseptics and disinfectans – definition and distinction – phenolic compounds, chlorocompounds and cationic surfactant.

(15hrs)

UNIT III : ANTIPYRETIC, ANALGESICS, ANTI-INFLAMMATORY AGENTS

(15hrs)

Classification – action of analgesics – narcotic analgesics – morphine and its derivatives – SAR – synthetic analgesics – pethidine, methadones, salicylic acids and its derivatives. Indolyl derivatives, aryl-acetic acid derivatives, pyrazole, para aminophenol – derivatives – mechanism of action.

UNIT IV: ANAESTHETICS

Definition – classification – uses of volatile anasthetics – nitrous oxide, cyclo-propane, chloroform, storage – advantages and disadvantages. Intravenous anesthetics – thiopental sodium, methohexitone. Local anesthetics – cocaine, benzocaine.

CARDIOVASCULAR DRUGS

Cardiacglycosides, anti-hypertensive drugs, vasodilators, anti-anginal agents, anti-arrhythmic agents, lipid lowering agents. (2 examples for each.)

UNIT V: BLOOD AND DRUGS FOR CHROMIC DISEASES (15hrs)

Grouping, composition, Rh factor, blood pressure, hyper tension and hypotension.

Causes, medicines and their mode of action for the treatment of cancer – antineoplastics – diabetes – hypoglycemic agents and AIDS – AZT, DDC.

Books for Study:

- 1. Jayashree Ghosh, A text book of pharmaceutical chemistry, S. Chand, 3rd edition, 2012..
- 2. S. Lakshmi, Pharmaceutical chemistry, S. Chand, 1995.
- 3. Dr.D.Gajapathy, Prof.Sasikala amala suriya, A text book of pharmaceutical chemistry.

Books for Reference:

- R.S. Satokar and Popular prakashan, Pharmacology and pharmatherapeutics vol. I & II, 1973.
- 2. O.D. Tyagi, A text book of Synthetic Drugs, Anmol publications, 2002.
- 3. J. Awapara, Introduction to biological chemistry Prentice hall, 1968.
- 4. David. L. Nelson, W.H. Freeman & Co., Lehninger Principles of Bio-chemistry, 2012.
- 5. J. L. Fairley, Essentials of biological chemistry East West press, 1971.

Website

- 1. <u>https://www.pharmpress.com</u>
- 2. <u>https://kundoc.com</u>
Outcome of learning

- Can able to study about the important terminologies of Pharma Chemistry, and brings about the knowledge towards Indian Medicinal Plants.
- Can able to know about Sulpha drugs, Antibiotics and their important features, and gives the clinical uses of Antiseptics and disinfectants.
- Gives a knowledge towards the Basic information about Analgesics, Anti pyretic drugs, and the drugs affecting CNS; and its examples.
- Brings about a clear idea towards Anaesthetics and its significants, and provide the importantance of the drugs for cancer, Diabetes, AIDS and Blood related diseases.
- Can brings the knowledge toward Vitamins and their classifications. To give the informations about harmones and enzymes along with their physiological functions and mode of actions through a specific mechanism.

BHARATHI WOMEN'S COLLEGE (AUTONOMOUS), CHENNAI – 600108. B.Sc CHEMISTRY ELECTIVE I - ANALYTICAL CHEMISTRY

(For the students admitted from the year 2019-2020)

HOURS PER WEEK : 4 CREDITS : 4

SEMESTER : V SUBJECT CODE : 19ECA

Objectives

- > This paper aims to explain the different types of errors and data handling.
- > This also imparts an in depth knowledge on the principles of gravimetric analysis.
- In addition, different spectroscopic techniques like UV-VIS, IR, Raman and NMR are elaborated

UNIT I: DATA ANALYSIS

Determinate and indeterminate errors – types of error – idea of significant figures and its importance – examples – precision, accuracy – methods of expressing precision – average deviation – standard deviation and confidence limits.

Principles of gravimetric analysis: Characteristics of precipitating agents – choice of precipitant and conditions of precipitation – specific and selective precipitants – DMG – Oxime- use of sequestering agents- EDTA.

UNIT II : UV-VISIBLE SPECTROSCOPY

Absorption laws – Lambert's law – Lambert – Beer's law. Instrumentation – photo colorimeter – visual comparator – duplicate method. UV spectrophotometer – block diagram with description of components – detectors. Barrier layer cell – phototube – photomultiplier tube – theory of electronic spectroscopy – types of electronic transition – applications – chromophore – auxochrome.

UNIT III : INFRARED SPECROSCOPY

Introduction – principles – rotational energy levels – rotational frequencies – methods of vibration – force constant – requirements of IR absorption.

Vibrational frequencies – factors influencing vibrational frequencies. Instrumentation – block diagram – source – monochromator, cell, sampling techniques, detectors- applications.

Rayleigh and Raman scattering – stokes and anti-stokes lines. Differences between Raman and IR spectroscopy. Advantages of Raman spectra over IR spectra, mutual exclusion principle,

(12hrs)

(12hrs)

UNIT IV : MASS SPECTROSCOPY

Basic principles- theory- instrumentation – determination of molecular formula – McLafferty rearrangementmetastable ion (or) peaks – the Nitrogen rule- general fragmentationmodes- Alcohols- Alkyl halide-Aldehyde(aliphatic/aromatic)- Phenol.

UNIT V-SEPARATION METHODS

chromatographic methods, Principles of differential migration and adsorption phenomenon – Nature of the adsorbent solvent systems – Rf values – Paper chromatography – various modes of development: ascending, descending and horizontal, Detection of spots – Two dimensional - reversed phase and preparative paper chromatography, Thin layer chromatography – Coating materials – Preparation of plates – Solvents for development and detection – Preparative TLC – Applications.

Column chromatography: Adsorption and partition methods: Nature of the column materials, preparation of the column, solvent system and detection methods.

Books for Study:

- D. A. Skoog and D. M. West, Fundamental of Analytical Chemistry, 7th Edition, International Edition, Saunders College Publishing, Philadelphia, Holt, London, 1996.
- 2. S.M. Khopkar, Basic Concepts of Analytical Chemistry, Wiley Eastern. 1984.
- 3. F. Settle, Handbook of Instrumental Techniques for Analytical Chemistry, Prentice Hall, 1997.

Books for Reference:

- 1. G.D Christian, Analytical Chemistry, 5th Ed., John Wiley, 1994.
- 2. L.G Hargis, Analytical Chemistry: Principles and Techniques, Prentice Hall, 1988.
- 3. D. A Skoog, Principles of Instrumental Analysis, Saunders College Pub. Co, III Edn., 1985.
- 4. R. A Day, Jr. and A.L.Underwood, Quantitative Analysis, 6th edition, Prentice Hall, 1991.
- 5. S.M Khopkar, Environmental Solution Analysis, Wiley Eastern Ltd., New Delhi, 1993.

Website

- 1. www.freebookcentre.net
- 2. https://www.ftc.gov
- 3. https://www.elsevier.com

Outcome of learning

- Students can enable to handling the instruments with the proper analytical methods and also gives the safety measurements towards the laboratory techniques.
- It brings about terms and methods of finding error analysis, and can able to determine the sources of errors and its effects towards analytical results.
- It can enable the methods for doing titrimetric techniques along with the details of aqueous & non-aqueous solvents, strong and weak acid base concepts.

(12hrs)

(12hrs) Classification of

- Brings about the methods of gravimetric analysis; can able to know the concepts and methods of precipitation techniques and Thermal Gravimetric Analysis.
- Clearly brings about the principles and methods of separation techniques and their applications.

BHARATHI WOMEN'S COLLEGE (AUTONOMOUS), CHENNAI - 600108. **B. Sc CHEMISTRY** MATERIAL CHEMISTRY (For the students admitted from the year 2019-2020)

HOURS PER WEEK:4 CREDITS:4

SEMESTER : V SUBJECT CODE : 19ECB

Objectives

To provide the theories and concepts of selected materials widely used for commercial \geq applications.

UNIT I : INORGANIC ENGINEERING MATERIALS - I

Abrasives-classification-characteristics -applications- Refractory- classification- characteristics-Refractoriness- Thermal spalling- applications- Lime-classification-characteristics- applications.

UNIT II : INORGANIC ENGINEERING MATERIALS - II

Cement- characteristics- functions of ingredients- chemical composition- setting and hardening. Concrete- classification-characteristics - applications. Composites- classification-characteristics applications.

UNIT III: ORGANIC MATERIALS

Dyes- classification-characteristics - applications. Carbonated beverages- characteristics - Prosnand Cons. Food additives - classification-characteristics - Pros and Cons.

UNIT IV : MATERIAL ANALYSIS

Determination of p^H- any five varieties of carbonated beverages and water.

UNIT V: RUBBER

Natural rubber- vulcanization – applications-Synthetic rubbers – preparation- properties – uses(any five).

(12hrs)

(12hrs)

(60hrs)

(12hrs)

(12hrs)

Outcomes:

> To understand fundamental and basic concepts of material science and polymers.

To understand the unique properties and character of organic, inorganic materials and polymer materials.

> To get job opportunities in leather industries.

Books for Study:

S. S Dara, Engineering Chemistry, S. Chand and Company Ltd, New Delhi, Revised Edition.
2003.

2. P. C Jain and Monika Jain, Engineering Chemistry, Dhanpat Rai Publishing Company(P) Ltd.

3. O. B Khanna, Material Science and Metallurgy, Material Science and Metallurgy, Dhanpat Rai Publication.

Books for Reference:

- 1. R. K Rajput, Material Science and Engineering, S. K Kataria and Sons, New Delhi.
- 2. C. V Agarwal, Chemistry of Engineering Materials, Tata McCraws Hill, 1997.
- 3. R. B Gupta, Material Science and Process, Tech India Publications.

BHARATHI WOMEN'S COLLEGE (AUTONOMOUS), CHENNAI – 600108. **B. Sc CHEMISTRY** CHEMISTRY OF CONSUMER PRODUCTS (For the students admitted from the year 2019-2020) **HOURS PER WEEK: 4 SEMESTER : V CREDITS:4 SUBJECT CODE : 19ECC**

Objectives:

Students the basic knowledge in consumer product Chemistry and modern trends in \triangleright the industry.

 \triangleright To provide the practical training to the students in consumer product analysis

UNIT 1: SOAPS

Saponification of oils and fats. Manufacture of soaps. Formulation of toilet soaps. Different ingredients used. Their functions. Medicated soaps. Herbal soaps. Mechanism of action of soap. Soft soaps. Shaving soaps and creams. ISI specifications. Testing procedures/limits.

UNIT 2: DETERGENTS

a. Anionic detergents: Manufacture of LAB (linear alkyl benzene). Sulphonation of LAB preparation of acid slurry. Different ingredients in the formulation of detergent powders and soaps. Liquid detergents. Foam boosters. AOS (alpha olefin sulphonates.

b. cationic detergents: examples. Manufacture and applications.

c. Non-ionic detergents: examples. Manufacture of ethylene oxide condensater.

d. Mechanism of action of detergents. Comparison of soaps and detergents. Biodegradation environmental effects. ISI specifications / limits.

UNIT 3: SHAMPOOS

Manufacture of SLS and SLES. Ingredients. Functions. Different kinds of shampoos - antidandruff, anti-lice, herbal and baby shampoos. Hair dye. Manufacture of conditioners. Coco betaines or coco diethanolamides – ISI specifications. Testing procedures and limits.

(12hrs)

(12hrs)

(60hrs)

UNIT 4: SKIN PREPARATIONS

(12hrs)

Face and skin powders. Ingredients, functions. Different types. Snows and face creams.

Chemical ingredients used. Anti perspirants. Sun screen preparations. UV absorbers. Skin bleaching agents. Depilatories. Turmeric and Neem preparations. Vitamin oil. Nail polishes: nail polish preparation, nail polish removers. Article removers. Lipsticks, roughes, eyebrow pencils. Ingredients and functions – hazards. ISI specifications.

UNIT 5: MARKETING AND LICENSING

Leading firms, brand names, choosing the right product. Packing regulations. Marketing.

Licensing – drug license – legal aspects. GMP – ISO 9000/12000 – consumer education. Evaluation of the product – advertisements.

Outcomes:

- To study about, application of chemistry in consumer products.
- To learn about the chemical composition of shampoo, detergents and soaps.
- > To study the ingredients in consumer products. .
- > To get job opportunities in wide sector of chemical and cosmetic industries.
- To be an entrepreneur to start small industry.

Books for Reference:

- 1. Gobala Rao.S, Outlines of chemical technology, Affiliated East West press, 1998
- 2. Kafaro, Wasteless chemical processing, Mir publishers, 1995.
- 3. Sawyer.W, Experimental cosmetics, Dover publishers, New york, 2000.

BHARATHI WOMEN'S COLLEGE (AUTONOMOUS), CHENNAI - 600108. **B.S c CHEMISTRY INORGANIC CHEMISTRY**

(For the students admitted from the year 2019-2020)

HOURS PER WEEK:5 CREDITS : 5

SEMESTER : VI SUBJECT CODE : 19CCH

(75Hrs)

Objectives:

- > The objective of this unit is to introduce the students about the transition and inner transition elements.
- \blacktriangleright The objective of this unit is to expose the students about the basic concepts of coordination complexes
- \blacktriangleright The objective of this unit is to help the students to understand the development and uses of bioinorganic compounds.

UNIT I: d-BLOCKS ELEMENTS

Chemistry of transition elements – electronic configuration – group study of titanium, vanadium, chromium, manganese and iron metals - comparative study of zinc group metals - Important uses of transition metals and their alloys.

Horizontal comparison with Fe, Co, Ni groups - toxicity of Cd and Hg - oxides, mixed oxides, halides, and oxohalides of transition metals - synthesis and reactivity of vanadates, chromates, dichromate, molybdates, tungstates, tungsten bronzes, manganate, permanganate - polycations -Interstitial compounds – nitrides, carbides, hydrides, borides of Ti, V, Cr, W and their industrial uses.

UNIT II : f-BLOCKS ELEMENTS

General characteristics of f-block elements - comparative account of lanthanides and actinides lanthanide series – separation by ion exchange and solvent extraction methods – lanthanide contraction – actinide series - separation of actinides - oxidation states and general properties - Uranium occurrence and metallurgy – chemical properties of oxides, hydrides and halides.

UNIT III : CO-ORDINATION CHEMISTRY I

(15hrs)

IUPAC nomenclature - theories of coordination compounds -Werner, Sidgwick, valence bond,

(15hrs)

(15hrs)

Crystal Field theory. Crystal field splitting in octahedral, tetrahedral and square planar fields – factors influencing the magnitude of crystal field splitting – CFSE in weak and strong fields calculations; pairing energy. Jahn-Teller distortion.

Magnetism and Colour: Orbital and spin magnetic moments, spin only moments of dⁿ ions and their correlation with effective magnetic moments, including orbital contribution; quenching of magnetic moment

UNIT IV CO-ORDINATION CHEMISTRY II

Stability of complexes -factors affecting the stability of complexes - Stability constants of coordination compounds and their importance in inorganic analysis. Kinetic verses thermodynamic stability.

Experimental determination of stability constant and composition of complexes. Isomerism, reactivity and stability: Determination of configuration of cis- and trans- isomers by chemical methods.

Labile and inert complexes, substitution reaction on square planar complexes, trans effecttheories (example and applications).

 $Reaction\ mechanism\ -\ substitution\ reactions\ in\ octahedral\ complexes\ -\ Acid\ hydrolysis:\ S_N1 \\ and\ S_N2\ mechanisms$

UNIT V BIO INORGANIC CHEMISTRY

(15hrs)

Metal ions in biology and their vital role in the active site, Structure and functions of Metallo proteins and enzymes. Structures and characteristic features of Haemoglobin and myoglobin – Vitamin B12.

Biological functions of haemoglobin and myoglobin, cytochromes and ferredoxins, carbonate bicarbonate buffering system and carbonic anhydrase.

Biological nitrogen fixation, Photosynthesis: Photosystem-I

Books for Study:

- 1. P.L. Soni, S. Chand, Text book of Inorganic chemistry –20th edition, 2003.
- 2. Puri, Sharma and kalia, Principles of Inorganic chemistry Milestone, 2011.
- 3. B.L. Agarwal and S.K. Agarwal Text book of Inorganic chemistry.
- 4. Gopalan, Text book of Inorganic chemistry –University Press, 2012.

(15hrs)

Books for Reference:

- 1. Agarwal, Advanced inorganic chemistry
- 2. Bahl, A.N. Sharma, Ram Chand and Co, Comprehensive inorganic chemistry 1966.
- 3. Gurdeep Chatwal and M.S. Yadav, Co-ordination chemistry –Himalaya Pub, 1992.
- 4. Madan, Malik and Tuli, Selected Topics in Inorganic Chemistry -S. Chand, 1976.
- 5. S.F.A. kettle, Co-ordination Chemistry ELBS, 1973.
- Satya Prakash, G.D. Tuli, S.K. Basu and R.D. Madan, Advanced Inorganic Chemistry Vol. II, S. Chand, New Delhi, 2010.
- 7. S. J. Lippard and J. M. Berg, Principles of Bioinorganic Chemistry, Panima Publishing Corporation, 1997.
- 8. Kaim and B. Schwederski, Bioinorganic Chemistry: Inorganic Elements in the Chemistry of Life, (An Introduction and Guide), John Wiley and Sons, 1994.
- 9. K. Husaain, Reddy Bio-inorg.chem. New age international Pvt. Ltd., 2007.
- G.N. Mugharjee and Arabinda Das Elements of Bio-inorganic Chemistry, Dhur and sons Pvt. Ltd., Kolcotta, 1993.
- 11. W.Kaim and B. Schewederski, Bioinorganic Chemistry : Inorganic Elements in the Chemistry of lif, John Wiley & Sons, New York, 1994.
- 12. R. W. Hay, Bio Inorganic Chemistry (Chemical Science series) Ellis Horwood Ltd., 1984.

Website

- 1. https://chem.libretexts.org
- 2. https://www.byjus.com
- 3. https://en.m.wikibooks.org

Outcome of learning

- The students will acquire knowledge of transition metal alloys, applications of transition and inner transition elements.
- The students become familiar with the nomenclature and theories of coordination compounds.
- Enable the students to apply the theory to the complexes and applications of coordination complexes in inorganic analysis.
- The students will have a better understanding of hemoglobin, myoglobin, vitamin B₁₂ and role of metal ions in biological systems.

BHARATHI WOMEN'S COLLEGE (AUTONOMOUS), CHENNAI – 600108. B.Sc CHEMISTRY ORGANIC CHEMISTRY – II (For the students admitted from the year 2019-2020) HOURS PER WEEK : 6 SEMESTER : VI CREDITS : 5 SUBJECT CODE : 19CCJ

(90Hrs)

Objectives

- To effectively impart a knowledge on dicarboxylic acids, acid derivatives, nitro compounds and amines.
- To explain the basic concepts in conformational analysis of organic molecules. In addition, the reaction mechanism and synthetic applications of aliphatic and aromatic substitution and elimination are highlighted.
- To make the students more inquisitive in learning the mechanistic details in organic chemistry through molecular rearrangements. To emphasize the industrial importance of alkaloids and terpenoids.

UNIT I : ALIPHATIC AND AROMATIC ACIDS

Preparation of carboxylic acids, acidity of carboxylic acids, effects of substituents on acid strength, acidity of aliphatic vs aromatic acids. Reactions of carboxylic acids - Hell-Volhard-Zelinsky reaction.

Methods of preparation and chemical reactions of a) mono, di, tri halo acids b) Hydroxy acids - malic, tartaric and salicylic acids c) unsaturated monocarboxylic acids d) saturated dicarboxylic acids (4C, 5C and nC) e) Unsaturated dicarboxylic acids(crotonic acid and cinnamic acid).

Preparation and reactions of carboxylic acid derivatives - acid chlorides, esters, amides and anhydrides. Relative stability of acyl derivatives - interconversion of acid derivatives by nucleophilic acyl substitution.

(**18hrs**)

UNIT II : NUCLEOPHILIC SUBSTITUTION/ELIMINATION REACTIONS (18hrs)

Mechanism of S_N1 , S_N2 , S_Ni substitution – effect of solvent polarity on the rates – general comparison of different attacking nucleophiles and leaving groups.

Stereochemistry of S_{N1} and S_{N2} reactions – Walden inversion – neighboring group participation one evidence – basic hydrolysis of β -bromo propionate ion – steric effect with the respect to the structure of substrates and attacking reagents.

Elimination reactions: E_1 and E_2 reactions – dehydration, dehydro halogenation – Saytzeff's rule, Hofmann's rule.

UNIT III : MOLECULAR REARRANGEMENT

Rearrangement to electron-deficient carbon - 1,2 shift (Wagner-Meerwein rearrangement, pinacol rearrangement, Wolff rearrangement, benzil-benzilic acid rearrangement). Aromatic rearrangements from oxygen to ring carbon – Fries, Claisen and benzidine rearrangement.

Rearrangement to electron-deficient nitrogen – Beckmann, Schmidt, Hofmann, Lossen, Curtius rearrangement. Rearrangement to electron-deficient oxygen: Baeyer-Villiger oxidation, hydroperoxide rearrangement, Dakin reaction.

UNIT IV: ALKALOIDS & TERPENOIDS

Alkaloids: Definition - classification with suitable examples for each class - Sources, isolation and structural elucidation of piperine, conine and nicotine.

Terpenoids: definition, isoprene rule and classification with suitable examples - Isolation, properties, structural elucidation of citral, geraniol and α – terpeniol.

UNIT V: CONFORMATIONAL ANALYSIS

Conformational nomenclature: eclipsed, staggered, gauche and anti; dihedral angle, torsion angle, energy barrier of rotation - potential energy diagram. Relative stability of conformers on the basis of steric effect, dipole-dipole interaction, H-bonding.

Conformational analysis of ethane, propane, n-butane, haloethane, 1,2-dihaloethane and cyclohexane with energy diagram.

(**18hrs**)

(**18hrs**)

(Ioms)

(18hrs)

Books for Study:

- 1. R. T. Morrison and R. N. Boyd, Organic Chemistry, 6th edition, prentice hall, 1992.
- 2. I. L. Finar, Organic Chemistry Vol-1, 6th edn, Pearson Education Asia, 2004.
- 3. Ernest L. Eliel, H. Samuel, Wilen and Lewis N. Mander. Stereochemistry of Organic Compounds. New York: Wiley, 1994.

Books for Reference:

- F A Carey and R J Sundberg, Advanced Organic Chemistry, Part A: Structure and Mechanisms, 5th edition, Springer, 2007.
- 2. P. S.Kalsi, Stereochemistry conformation and mechanism, New age international, 2008.
- Arun Bahl and B.S. Bahl, A Text Book of Organic Chemistry, 22ndedn, S Chand & Company, 2016.
- 4. P. Y.Bruice, Organic Chemistry, Vol-1 & 2, 7thedn, Pearson Education Asia, 2012.
- 5. J. Clayden, N. Greeves, S. Warren, Organic Chemistry, 2ndedn, Oxford, 2012.
- 6. D. Nasipuri, Stereochemistry of Organic compounds principles and applications, New age international, 2008
- 7. G. Marc loudan, Organic Chemistry, 5th edition, Roberts and company, 2009.
- K.S. Tewari, S.N. Mehrotra and N.K. Vishnoi, A Text book of organic chemistry Vikas Publishing house Pvt. Ltd., 3rd edition, 2009.
- P.L.Soni and H. M. Chawla, Text book of Organic chemistry S. Chand, 28th revised edition, 2011.

Website

- 1. <u>https://chem.libretexts.org</u>
- 2. www.chem1.com
- 3. <u>https://open.umn.edu</u>
- 4. <u>https://learn.saylor.org</u>

Outcome of learning

- To enable the students to understand various types of reaction mechanisms involved in synthetic organic transformation.
- > It reveals the types of rearrangement reactions and its synthetic applications
- Students can learn about the classification, structure and properties of Alkaloids, Terpenoids, Steroids, Hormones, Amino acids and proteins.
- > To enable the students to understand the concept of asymmetric synthesis.

BHARATHI WOMEN'S COLLEGE (AUTONOMOUS), CHENNAI –600108. B.Sc CHEMISTRY PHYSICAL CHEMISTRY – II (For the students admitted from the year 2019-2020)

HOURS PER WEEK : 6 CREDITS : 5 SEMESTER : VI SUBJECT CODE : 19CCK

(90Hrs)

Objectives

- > To learn the basic concepts of catalysis and photochemistry.
- To effectively impart the details of electrochemistry and electrochemicalcells.
- Understand the rules and concepts of group theory

UNIT I: ELECTRICAL CONDUCTANCE- I

Metallic and electrolytic conductors – specific, equivalent and molar conductance – measurement of conductance– variation of molar conductance with dilution for strong and weak electrolytes (qualitative explanation). Transport number and its determination by Hittorff and moving boundary method – effect of temperature and concentration – ionic mobility and ionic conductance – Kohlrausch law and its applications

UNIT II : ELECTRICAL CONDUCTANCE - II

Application of ionic conductance – determination of weak electrolytes – solubility and Ksp of sparingly soluble salts – degree of dissociation of weak electrolytes – calculation of ionic conductances

– conductometric titration – determination of pH – Theory of strong electrolytes – Debye-Huckle Onsager theory – verification of Onsager equation – Wein-Debye Falkenhagen effect.

Activity and activity co-efficient of a strong electrolyte – ionic strength – Debye-Huckel limiting law (No derivation) – experimental verification only – Hydrolysis of salts – hydrolytic constant – degree of hydrolysis and pH of different types – Buffer action. – determination of hydrolysis by conductance and distribution methods.

UNIT III : ELECTROCHEMICAL CELLS- I

(**18hrs**)

Galvanic cells - reversible and irreversible cells - EMF and its measurement - standard

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(18hrs)

(18hrs)

cell – types of reversible electrodes – electrode reactions – measurement of electrode potentials using reference electrode – derivation of Nernst equation for EMF of cells and electrode potentials – standard electrode potentials – sign conventions – electro chemical series and its significance.

UNIT IV: ELECTROCHEMICAL CELLS- II

(**18hrs**)

Applications of emf measurement – calculation of G, H, S and equilibrium constants – determination of pH using hydrogen, glass and quinhydrone electrodes – potentiometric titrations.

Concentration cells with and without transference – liquid junction potential – expression for it – application of concentration cells – valency of ions – transport number – solubility product – activity co-efficient.

Polarization – decomposition potential – over-voltage – storage cells – lead acid battery, Ni-Cd, Li-Fe battery – mechanism of discharging and recharging – fuel cells (H₂-O₂).

UNIT V : GROUP THEORY

(18hrs)

Symmetry elements – symmetry operations – various point groups with examples – point groups –examples; H₂O, NH₃, H₂O₂, BCl₃ and CH₄- identification and determination – comparison of molecular and crystallographic symmetry- Matrix representation of symmetry operations.

Books for Study:

- 1. B. R. Puri, L.R. Sharma and D.K. Pathania, Principles of physical chemistry, Vishal Pub. Co.,2013.
- 2. P. L.Soni, Text book of physical chemistry, Sultan Chand &Co., 2014.
- 3. S. Glasstone, Introduction to Electrochemistry, Maurice Press, 2008.

Books for Reference:

- 1 Glasstone and D. Lewis, Elements of physical chemistry, Macmillan, 1970.
- 2 Walter and Moore, Physical chemistry, Orient Longman, 1999.
- 3 Amalendu Ghoshal, Numerical problems on physical chemistry, Books and Allied Pvt. Ltd, 6th
- 4 edition, 2013.
- 5 D.V.S Jain and S.P., Jainhar. Physical chemistry, Principles and problems, Tata McGraw Hill, 1988.
- 6 K. K Sharma and L. K Sharma, A Text book on physical Chemistry, 6th ed., Sultan Chand, 2016.
- 7 S. H Maron and J. B Lando, Fundamentals of Physical Chemistry, Macmillan.
- 8 P.W. Atkins and J. D. Paula, Elements of Physical Chemistry, Oxford University Press, 2017

Website

- 1. <u>www.freebookcentre.net</u>
- 2. <u>https://www.goodsread.com</u>
- 3. <u>www.sakshieducation.com</u>
- 4. https://m.jagranjosh.com

Outcome of learning

- Students can gain knowledge on electro chemical conductance and the applications of conductance measurements.
- > Students can learn about the galvanic cells and its applications
- Students can gain knowledge on the determination of pH, storage cells and fuel cells.
- Students can learn the basics of group theory

BHARATHI WOMEN'S COLLEGE (AUTONOMOUS), CHENNAI – 600108. B.Sc CHEMISTRY ELECTIVE- II NUCLEAR AND SOLID STATE CHEMISTRY (For the students admitted from the year 2019-2020) HOURS PER WEEK : 4 SEMESTER : VI CREDITS : 4 SUBJECT CODE : 19ECB

(60Hrs)

Objective:

- The objective of this unit is to introduce the students about the composition and stability of the nucleus and types of nuclear reactions.
- The objective of this unit is to enlighten the students about the Natural and artificial radioactivity.
- The objective of this unit is to expose the students to the basic concepts of structure of solids, electrical and magnetic properties of solids.
- The objective of this unit is to know the role and function of conductors, superconductors and solid state materials.

UNIT I: NUCLEAR CHEMISTRY I

Introduction – composition of nucleus and nuclear forces – nuclear stability – mass defect – binding energy – packing fraction – N/P ratio – magic numbers – nuclear models – liquid drop – Shell and collective model. Isotopes – detection and separation – deviation of atomic weights from whole numbers – isobars, isotones and isomers – Radioactive decay and equilibrium – nuclear isomerism – internal conversion - types of reactions – fission and fusion.

UNIT II : NUCLEAR CHEMISTRY II

Natural and induced radioactivity – radioactive decay – half-life period – radioactive displacement law – radioactive series – Radioactive techniques – Geiger Muller and ionization counters. Natural radioactivity – Detection and measurement of radioactivity – radioactive series including neptunium series – group displacement law – Rate of disintegration and half-life period – Average life

(12hrs)

period – uses of radioisotopes – hazards of radiations – nuclear energy – nuclear reactors – Spallation – photonuclear and thermo nuclear reactions – energy source of the sun and stars - nuclear waste disposal – applications of nuclear science in agriculture, biology and medicine – Atomic power projects in India.

UNIT III : SOLID STATE CHEMISTRY

Ionic bonding – lattice energy – Born equation and its derivation, radius ratio rules – structures of some ionic crystals – Structure of solids – comparison of X-ray and Neutron diffraction – derivation of Bragg's equation. Defects in solids, non-stoichiometric compounds – Electrical, Magnetic and optical properties of solids – band theory – semiconductors – superconductors. Solid state electrolytes – Types of magnetic behavior, dia, para, ferro, antiferro and ferrimagnetism.

UNIT IV : STRUCTURE OF SOLIDS

Classification of solids – amorphous and crystalline solids – Van der waals crystals – covalent crystals – Laws of crystallography – Elements of symmetry – Weiss and Miller indices – Crystal systems and Bravais lattices. Structure of ionic solids – crystal structures – Sodium chloride, Zinc blende, wurtzite, Cesium chloride– Identification of simple cubic, bcc, fcc lattices and indexing of X-ray lines. Crystal defects – Schottky and Frenkel defects- special applications of solid state materials.

UNIT V : MATERIAL CHEMISTRY

Introduction – techniques for synthesis of nanophase materials –sol-gel synthesis- electro deposition –inert gas condensation-mechanical alloying –properties of nanophase materials – applications of nanophase materials, composite materials.

Superconductivity – introduction– examples of superconducting oxides- Meissner effect– applications of superconducting materials.

Books for Study:

- 1. H. J. Arniker Essentials of Nuclear chemistry, , new Age International, 2009.
- 2. R. Gopalan, Nuclear Chemistry, Vishal Publishers, 2009.
- 3. A. R West, Solid state chemistry,

Books for Reference:

- 1. S. Glasstone, Source book of atomic energy, MacMillan, 1954.
- 2 G. Frienlander J. W. Kennedy and J.M. Miller, Nuclear and radiochemistry, Wiley Publishers, 2013.

(**12hrs**)

(12hrs)

Website

- 1. https://wps.prenhalt.com
- 2. https://www.visionlearning.com
- 3. https://www.sas.upenn.edu
- 4. https://www.chemlibretexts.org

Outcome of learning

- Study of nuclear reactions that are used both to generate electricity and to create weapons of massive destruction
- Understand the factors that determine the biological effects of radiation, absorbed dose andpenetrating ability.
- > Study the effects of positron emission and converting a proton to neutron

BHARATHI WOMEN'S COLLEGE (AUTONOMOUS), CHENNAI – 600108. B. Sc CHEMISTRY FOOD CHEMISTRY AND ADULTERATION (For the students admitted from the year 2019-2020)

HOURS PER WEEK : 4 CREDITS : 4

SEMESTER : VI SUBJECT CODE : 19ECE

(60Hrs)

Objectives:

- > To understand the basic information of food chemistry and adulteration.
- > To appreciate the importance of food additives and pesticide control.
- > To provide an information about food preservatives

UNIT-I: INTRODUCTION

Food: source, functions of food – food groups – food guide – basic five food groups, usage of the food guide – food in relation to health – objectives of cooking.

Water: Purification processes – Ion exchangers, reverse osmosis, activated charcoal treatment - Use of chlorination, ozone, and UV light disinfection. Specification of drinking water.

UNIT-II: CONSTITUENTS OF FOODS

Carbohydrates: Classification, Principles involved in the analysis of carbohydrates – estimation of carbohydrates.

Proteins: amino acids – peptides - Analysis of proteins – Separation of amino acids by paper chromatography.

Minerals and vitamins: Sources, functions, deficiency of the following minerals (calcium, iron, iodine, fluorine, sodium and potassium (elementary treatment). Vitamins - classification, sources, Vitamins – A, D, E and K, C, B Complex, - B6 & B12.

(**12hrs**)

UNIT-III: FOOD ADDITIVES

Artificial sweeteners – saccharin, cyclomate, asparatame – food flavours – esters, aldehydes and heterocyclic compounds. Antioxidants. Food colours – changes in cooking..Restricted use. Spurious colours. Emulsifying agents, preservatives – leavening agents. Baking powder – Yeast. Taste enhancers – MSG-vinegar

UNIT-IV: PESTICIDES CONTROL

Spoilage of foods by insects and pests, loss in food quantity and quality Various pesticides used in agriculture and post-harvest storage, uses of pesticides for food grain application.

UNIT-V: FOOD ADULTERATION

Common adulterants in different foods – milk and milk products, vegetable oils, and fats, spices and condiments, cereals, pulses, sweetening agents and beverages. Contamination with toxic chemicals – pesticides and insecticides.

Outcomes:

- > To know about the basic criteria of food and water standards for consumption
- > To get a basic idea about the chemical constituents of food
- To learn about the various food additives, their chemical composition and their permissible level of usage in foods.
- To know about the various organisms which spoil the crops pre and post harvest and their control using pesticides
- To know about the various food adulterants for different types of food and methods to detect those adulteration.

Books for Study:

- 1. Owen.R. Fennema, Food Chemistry, Marcel Decker Inc., New York. 1996.
- 2. M. Swaminathan, Text Book on Food chemistry, Printing and Publishing CO., Ltd., 1993.

Books for Reference:

- Siva Sankar, Food Processing and Preservation, Prentice Hall of India Pvt. Ltd., New Delhi, 2002.
- S. Ramakrishnan, K. G. Prasannam, R. Rajan, Principles Text book of medical biochemistry, Orient Longman Ltd., Third Edition, 2001.

(12hrs)

(12hrs)

BHARATHI WOMEN'S COLLEGE (AUTONOMOUS), CHENNAI – 600108. **B. Sc CHEMISTRY GREEN METHODS IN CHEMISTRY**

(For the students admitted from the year 2019-2020)

HOURS PER WEEK:4 CREDITS:4

Objective:

> To learn what is green chemistry twelve principles energy sources of a country and cases study

UNIT-I: INTRODUCTION

Definitions of Green Chemistry. Brief introduction of twelve principles of Green Chemistry, with examples, special emphasis on atom economy, reducing toxicity, green solvents,

UNIT –II: ALTERNATIVE SOURCES OF ENERGY

Green Chemistry and catalysis and alternative sources of energy, Green energy and sustainability

UNIT –III: SURFACTANTS

Surfactants for Carbon Dioxide – replacing smog producing and ozone depleting solvents with CO₂ for precision cleaning and dry cleaning of garments.

UNIT -IV: TOXICITY REPLACEMENT

Designing of Environmentally safe marine antifoulant. Right fit pigment: synthetic azopigments to replace toxic organic and inorganic pigments.

UNIT -V: GREEN SYNTHESIS

An efficient, green synthesis of a compostable and widely applicable plastic (poly lactic acid) made from corn.

(60hrs)

SUBJECT CODE : 19ECF

SEMESTER : VI

(12hrs)

(12hrs)

(12hrs)

12hrs)

Outcome:

- > To understand the importance of Green methods and its need for future of the mankind
- > To solve the problems of pollutions, degradation of environment
- To address the issues like degradation, global warming, the deplection of ozone layer and loss of biodiversity

Books for Study:

- Anastas, P.T. and Warner, J.K. Oxford Green Chemistry- Theory and Practical, University Press, 1998.
- 2. Matlack, A.S. Introduction to Green Chemistry, Marcel Dekker, 2001

Books for Reference:

- Cann, M.C. and Connely, M.E., Real-World Cases in Green Chemistry, American Chemical Society, Washington, 2000
- Ryan, M.A. and Tinnesand, M., Introduction to Green Chemistry, American Chemical Society, Washington, 2002
- Lancaster, Mike Green Chemistry: An Introductory Text 2nd Ed., RSC Publishing, ISBN 978-1-84755-873-2, 2010

BHARATHI WOMEN'S COLLEGE (AUTONOMOUS), CHENNAI – 600108. B.Sc CHEMISTRY ELECTIVE – III INDUSTRIAL CHEMISTRY (For the students admitted from the year 2019-2020) HOURS PER WEEK : 5 CREDITS : 5 SUBJECT CODE : 19ECG

Objectives

- \succ This paper aims to elaborate the varied applications of chemistry in industries.
- To impart the need of polymers, surface coatings, fuels and fertilizers and to appreciate their significance.
- > The quality standards of water and its treatment are detailed.

UNIT I: WATER TREATMENT

Water – sources – quality standards – water quality monitoring – colour, odour, taste, turbidity. Hard and soft water – estimation of hardness of water by EDTA method – scale and sludge – caustic embrittlement – priming and foaming – desalination of brackish water – reverse osmosis – electrodialysis – Domestic water treatment.

UNIT II : FUELS

Fuels: Types of fuels – calorific values – criteria for selecting fuels.

Solid fuels: Wood, Peat, Lignite, coal, charcoal - composition and uses.

Liquid fuels: Petroleum, petroleum products, tar, alcohols - their merits and de-merits.

Gaseous fuels: Advantages of gaseous fuels over other fuels – natural gas ,water gas, producer gas, oil gas, LPG – composition and uses.

UNIT III : FERTILIZERS

Fertilizers: need for fertilizer – essential requirements – classification, sources – Nitrogen fertilizer - manufacture of ammonium nitrate, ammonium sulphate, urea, calcium ammonium nitrate, calcium cyanamide.

(15hrs)

(15hrs)

(**75hrs**)

(15hrs)

Phosphate fertilizers: super phosphate of lime, double and triple super phosphates – composition and manufacture and uses.

Mixed fertilizers: NPK - composition and uses.

UNIT IV: POLYMERS

Nomenclature – Tacticity – Functionality – Types of polymerization – addition, condensation, co-polymerization and co-ordination polymerization – glass transition temperature – thermo plastic and thermo setting plastics – preparation – properties and uses of polythene. PVC, Teflon, Nylon and Bakelit.

UNIT V-SURFACE COATING:

Paints: Constituents – functions – special paints – fire retardant paints, water repellant paints, temperature indicating paints.

Varnish: Types – constituents and functions.

Enamels: Types – constituents – functions.

Metallic coating : Hot dipping, electro plating.

Books for Study:

- 1. B.K. Sharma, Industrial chemistry, Krishna's educational publishers, 2014.
- 2. M.G. Arora, Industrial chemistry, Anmol publications, 2002.
- 3. Jain & Jain, Engineering chemistry Dhanpat Rai, publishers, 2013.

Books for Reference

- 1. S.S. Dara, Text book of engineering chemistry, S. Chand, 2004.
- 2. George.T. Austin, Shreve's chemical process industry, McGraw Hill, 1984.
- 3. Jayashree ghosh, Fundamental concepts of applied chemistry, S. Chand, 2010.
- 4. Fred.W. Billmeyer, Text book of polymer science, 3rd edition, John wiley & sons, 1984.
- 5. V.R. Gowarikar, Polymer science, New Age International, 2010.
- 6. O.P. Veeramani & Nirula, Applied chemistry theory practice –Galgotia publications, 2004.
- 7. Norris Shreve, Chemical process industries3rd edition, McGraw Hill, 2004.
- 8. I. L.Finar, Organic chemistry vol. II. 3rd edition, Longmans Green & Co. 1964.

(15hrs)

(15hrs)

Website

- 1. www.nkpatel.co.in
- 2. <u>https://www.unibo.it</u>
- 3. <u>https://en.unipr.it</u>

Outcome of learning

- Gain knowledge about the purification of water, reuse of water and to rectify water problem.
- > Gain sound knowledge about fertilizers and Agro chemical industries
- Understand the Principles of Polymer reactivity and deep knowledge about various methods of polymerization and specialty Polymers.
- ➢ Gain knowledge about how to control corrosion by surface coating techniques
- > Painting and coating industry is vast and will be a success in the near future.

BHARATHI WOMEN'S COLLEGE (AUTONOMOUS), CHENNAI – 600108. B.Sc CHEMISTRY

BASIC CLINICAL AND BIOMEDICAL CHEMISTRY

(For the students admitted from the year 2019-2020)

HOURS PER WEEK : 5	SEMESTER : VI
CREDITS : 5	SUBJECT CODE : 19ECH

(75hrs)

Objectives :

After going through the course the student is expected to learn about

- > The disinfectants and antiseptics.
- > The important drugs and the mode of actions.
- ➢ Enzymes
- Body fluids

UNIT I: CLINICAL HYGIENE AND BIOCHEMICAL ANALYSIS (15hrs)

Definition of health. Ryde of WHO. Sterilization of surgical instruments. Disinfectants, antiseptics, sanitation. Biochemical analysis of urine, serum and fecal matter. Treatment for specific poisons-acids, alkalis, arsenic and mercury compounds.

UNIT II: COMMON DRUGS

Manufacture of drugs (e.g. quinine, reserpine, atopside and d – tubocurarine) from Indian medicinal plants. Testing of drugs : biological variation, screening and toxicity. Use of pharmacoepia and therpeutic index.

Types of drugs and their modes of action : Depressant drugs (special reference to sedatives and hypnotics). Anticonvulsant drugs (sodium valproate, hydantoins). Narcotic analgesics (only morphine compds). Antipyretic analgesics (acetyl salicyclic acid, p - amino - phenol derivatives). Muscle relaxants.

- a. Acting at neuromuscular junction (d tubocurarine chloride).
- b. Acting at spinal cord alone (glyceryl guaiacolate, diazepam).
- c. Antibiotics (pencillin, streptomycin, tetracyclin, chloramphenicol)

(15hrs)

- d. Cardiovascular drugs-nitrates, beta blockers(propranalol and atinelol) and calcium channel
- e. blockers.
- f. uclear medicine (Radiation therapy)

UNIT III: ENZYMES

Classification, specificity. Coenzymes, Cofactor, ATP, Mechanism of enzyme action and Immobilisation of enzymes.

UNIT IV: BODY FLUID

Blood volume, blood groups, coagulation of blood. Plasma lipo protiens. Blood pressure. Arteriosclerosis, diseases afecting red cells: Hyperchromic and hypochromic anaemia. Blood tranfusion. Blood sugar and diabetes.

UNIT V: BIOTECHLONOGY:

Heredity, recombinant DNA, Genetic engineering and its possible hazards, Gene splicing, manufacture of interferon and human insulin(Humulin), Drug manufacture based on fermentation(only antibiotics)

Books for Study:

1. Jayashree Ghosh, A text book of Pharmaceutical Chemistry, S.Chand and Co. Ltd, 1999.

2. S.C. Rastogi, Biochemistry, Tata McGraw Hill Publishing Co., 1993

3. Ashutosh Kar, Medicinal Chemistry, Wiley Eastern Limited, New Delhi, 1993.

Books for Reference:

 O.Le Roy, Natural and synthetic organic medicinal compounds, Ealemi., 1976.
B.L. Oser, Hawk's physiological chemistry, 14th edition, Tata-McGraw - Hill Publishing Co.Ltd, 1965
O. Kleiner and J. Martin, Bio-Chemistry, Prentice-Hall of India (P) Ltd, New Delhi,

1974.

(15hrs)

(15hrs)

(15hrs)

BHARATHI WOMEN'S COLLEGE (AUTONOMOUS), CHENNAI – 600108.

B. Sc CHEMISTRY

NANO CHEMISTRY

(For the students admitted from the year 2019-2020)

HOURS PER WEEK: 5

CREDITS: 5

OBJECTIVES:

• To introduce the Basics of Nanotechnology.

• To learn the Instrumental Techniques used in Characterisation of Nanomaterials.

UNIT-I BASICS OF NANOCHEMISTRY

Introduction – Definition – Length scales – Importance of Nanoscale and its Technology– Self Assembly of Materials - Self Assembly of Molecules - Porous solids, Nanowires, Nanomachines and Quantum Dots.

UNIT-II NANOPARTICLES

Introduction – Types of Nanoparticles – Preparation, Properties and Uses of Gold, Silicon, Silver, Zinc Oxide, Iron Oxide, Alumina and Titania Nanoparticles.

UNIT-III SYNTHETIC TECHNIQUES

Techniques to Synthesise Nanoparticles - Top down and Bottom up Approaches - Common Growth Methods - Characterisation of Nanoparticles - Applications and Toxic effects of Nanomaterials.

UNIT-IV NANOMATERIALS

Preparation, Properties and Applications of Carbon Nanotubes, Nanorods, Nanofibres and Nanoclays.

UNIT-V INSTRUMENTAL TECHNIQUES

Electron Microscopes - Scanning Electron Microscopes (SEM) - Transmission electron Microscopes (TEM) – Scanning Probe Microscopy – Atomic Force Microscopy (AFM) – Scanning Tunneling Electron Microscope (STEM) – Basic Principles only.

Books for Study

1. Nanotechnology, S. Shanmugam, MJP Publishers, Chennai (2010).

2. A Handbook on Nanochemistry, Patrick Salomon, Dominant Publishers and Distributers, New Delhi.

(15hrs)

(15hrs)

(15hrs)

(15hrs)

(15hrs)

(75hrs)

SUBJECT CODE : 19ECJ

SEMESTER : IV

3. Nanobiotechnology, S. Balaji, MJP Publishers, Chennai (2010).

Books for Reference

1. The Chemistry of Nanomaterials: Synthesis, Properties and Applications, Vol. Iand II, CNR Rao, Springer (2006).

2. Nanotechnology: Basic Science and Emerging Technologies, Mick Wilson, Kamali Kannangara, Geoff Smith, Michelle Simmons, Burkhard Raguse, Overseas Press (2005).

3. Nanochemistry, G. B. Segreev, Elsevier, Science, New York, (2006).

4. Nano: The Essentials, T. Pradeep, Tata Mc-Graw Hil Publishers, New Delhi (2007).

5. Text Book of Nanoscience and NanoTechnology, P. Shankar Baldev Raj, B. B. Rath and James Murday – 2014.

B.Sc., CHEMISTRY PRACTICAL SYLLABUS

PRACTICAL I (19CC1)

HOURS PER WEEK:3

CREDITS: 4

Objectives

To train the candidate in inorganic titrimetric analysis and to carry out different estimations.

INORGANIC TITRIMETRY:

- Preparation of approximately decinormal and exactly decinormal solutions of HCl, H₂SO₄, NaOH.
- 2. Estimation of sodium hydroxide, standard sodium carbonate.
- 3. Estimation of borax standard sodium carbonate.
- 4. Estimation of oxalic acid, standard Mohr's salt or FeSO₄.
- 5. Estimation of zinc, standard Potassium ferro cyanide.
- 6. Estimation of Mg using EDTA method.
- 7. Estimation of Ca using EDTA method.

PRACTICAL II (19CC2)

HOURS PER WEEK : 3 CREDITS: 4

Objectives

To train the candidate in inorganic compound preparation and identification of anions and cations by semi micro technique.

I. INORGANIC QUALITATIVE ANALYSIS:

Semi-micro techniques to be used:

a. Reactions of the following radicals:

Anions: Carbonate, Sulphate, Nitrate, Chloride, Bromide, Borate, Oxalate and Phosphate.Cations: Lead, Bismuth, Copper, Cadmium, Manganese, Zinc, Cobalt, Nickel, Calcium, Strontium, Barium, Magnesium and Ammonium.

b. Analysis of mixtures containing two cations and two anions, one of the anion being an interfering radical.

II. Preparation of the following compounds:

- 1. Ferrous ammonium sulphate.
- 2. Potassium tri oxalato chromate(III)
- 3. Cuprammonium sulphate.
- 4. Microcosmic salt.

PRACTICAL III (19CC3)

HOURS PER WEEK : 5 CREDITS: 6

Objectives

To train the candidate in organic compound preparation and to carry out systematic qualitative analysis of organic compounds with one functional group. To train the candidate in gravimetric estimations.

GRAVIMETRY AND ORGANIC PRACTICALS:

1. Preparations:

- 1. Oxidation of benzaldehyde.
- 2. Hydrolysis of methyl salicylate.
- 3. Bromination para bromo acetanilide.
- 4. Esterification ethyl benzoate.
- 5. Nitration of Nitrobenzene.
- 6. Ozonalysis of Glucose.

2. Systematic qualitative analysis of organic compounds with one functional group:

Characterize the following organic compounds with their derivative:

Aldehyde, Ketone, Carboxylic acid, Aromatic primary amine, Phenol, Aromatic Ester, Amide, Diamide, Anilide, Nitro Compound and Carbohydrate.

Gravimetric Analysis:

- 1. Estimation of Barium as BaCrO₄
- 2. Estimation of Barium as BaSO₄.
- 3. Estimation of Lead as PbSO₄.
- 4. Estimation of Lead as PbCrO₄
- 5. Estimation of Calcium as CaC₂O₄.H₂O

PRACTICAL IV (19CC4)

HOURS PER WEEK : 3 CREDITS: 5

PHYSICAL CHEMISTRY PRACTICALS:

Objectives

To train the candidate in determining the rate constants of different reactions, determining the molecular weight, determining the TT and CST, determining the distribution coefficient and to carry out conductometric titrations.

1. Kinetics:

- a. Determination of Rate Constant Acid catalyzed hydrolysis of an ester.
- c. Determination of rate constant Iodination of acetone (acid catalyzed)
- 2. Determination of K_f and molecular weight by Rast's macromethod.
- 3. Phase Rule.
 - a. Determination of critical solution temperature of Phenol- Water system.
 - b. Effect of electrolyte on CST of Phenol-Water system and determination of concentration of the electrolyte.
 - c. Determination of Transition Temperature of hydrated salts. (any one)
- 4. Phase diagram Simple Eutectic system
- 5.Conductometric Titrations:
 - a. Strong Acid Vs Strong Base
 - b. Mixture of Acids Vs Strong Base.

ALLIED CHEMISTRY PRACTICALS (19AC1)

HOURS PER WEEK : 3 CREDITS: 4

Objectives

To train the candidates in volumetric analysis and in carrying out the systematic analysis of organic compounds with one functional group.

a. Titrimetry:

- 1. Estimation of sodium hydroxide using standard sodium carbonate.
- 2. Estimation of hydrochloric acid using standard oxalic acid.
- 3. Estimation of borax using standard sodium carbonate.
- 4. Estimation of ferrous sulphate using standard Mohr's salt solution.
- 5. Estimation of oxalic acid using standard ferrous sulphate.
- 6. Estimation of potassium permanganate using standard sodium hydroxide.
P.G. DEPARTMENT OF CHEMISTRY SYLLABUS FOR B.Sc., CHEMISTRY

CHOICE BASED CREDIT SYSTEM – (2019 – 20) (Revised)

Sem	Class	Title of th	e Paper	Sub.Code	Credit	No.	Exam	No. of	Total
						of	Hrs.	Papers	marks
						Hrs			(25+75)
		Language	- I	19LAA	3	6	3	1	100
		English –	Ι	19GEA	3	4	3	1	100
		General C	hemistry – I	19CCA	5	6	3	1	100
		Practical –	- Qualitative Analysis	19CC1	-	3	-	-	-
Ŧ	I B.Sc.,	*Allied	Mathematics – I	19AAP	3	6	3	1	100
1	Chemistry		Zoology – I	19AEA		3	3	1	100
		Allied Pra	ctical -I		-	3	-	-	-
		SBE - Ess	entials of language &	19SZ1	2	2	3	1	100
		communication							
		Environm	ental Studies	19EVS	2	3	3	1	100
		Total			18	30		6	
		Language	- II	19LAB	3	6	3	1	100
		English –	Π	19GEB	3	4	3	1	100
		General C	hemistry –II	19CCB	5	6	3	1	100
		Practical –	- Qualitative Analysis	19CC1	5	3	3	1	100
	I R Sc		Mathematics – II	19AAQ		3	3	1	100
II	Chemistry	*Allied	Zoology – II	19AEA	3	3	3	1	100
	enembery		Mathematics – III	19AAR		3	3	1	100
		Allied Pra	ctical - I	19AE1	4	3	3	1	100
		SBE – Ess	sentials of speaking and	19SZ2	2	2	3	1	100
		presenting	skills.						
		VBE- Val	ue Based Education	19VBE	3	3	3	1	100

		Total		28	30		8	
		Language- III	19LAC	3	6	3	1	100
		English – III	19GEC	3	6	3	1	100
		General Chemistry – III	19CCC	5	5	3	1	100
	II B So	Practical – Volumetric Analysis	19CC2	-	3	-	-	-
III	II D.SC., Chemistry	Allied Physics	19ABA	3	3	3	1	100
	Chemistry	Allied Practical – I	19AB1	-	3	-	-	-
		SBE – Computing Skill	19SZ3	2	2	3	1	100
		NME- Polymer Chemistry	19NME1	2	2	3	1	100
		Total		18	30		6	
		Language – IV	19LAD	3	6	3	1	100
	II B Sc	English – IV	19GED	3	6	3	1	100
IV	Chemistry	General Chemistry –IV	19CCD	5	5	3	1	100

		Practical – Volumetric	19CC2	5	3	3	1	100
		Analysis						
		Allied Physics – II	19ABA	3	3	3	1	100
	H DC	Allied Practical – I	19AB1	4	3	3	1	100
IV	II B.Sc.,	SBE- Personality	19SZ4	2	2	3	1	100
	Chemistry	Development						
		NME- Agricultural	19NC2	2	2	3	1	100
		Chemistry						
		Extension Activities		3				
		Total		30	30		8	
		Organic Chemistry – I	19CCE	5	5	3	1	100
		Physical Chemistry – I	19CCF	5	5	3	1	100
		Pharmaceutical Chemistry	19CCG	5	5	3	1	100
		Practical – Gravimetric &	19CC3	-	4	-	-	-
		Organic Analysis						
X 7	III B.Sc.,	Practical - Physical	19CC4	-	3	-	-	-
V	Chemistry	Chemistry						
		Elective-I	19ECA	4	4	3	1	100
		Analytical Chemistry						
		Elective- II	19ECB	4	4	3	1	100
		Nuclear and Solid state						
		chemistry						
		Total		23	30		5	
		Inorganic Chemistry	19CCH	5	5	3	1	100
	III R So	Organic Chemistry - II	19CCJ	5	6	3	1	100
VI	Chemistry	Physical Chemistry – II	19CCK	5	6	3	1	100
		Practical – Gravimetric &	19CC3	6	5	6	1	100
		Organic Analysis						

Practical - Physical	19CC4	5	3	3	1	100
Chemistry						
Elective –III	19ECC	5	5	3	1	100
Industrial Chemistry						
Total		31	30		6	

Allied Chemistry for II Physics , Botany, Zoology & Bio-Chemistry

Sem.	Class	Title of the Paper	Sub.Code.	Credit	No.	Exam	No. of	Total
					of	Hrs.	Paper	marks(25+75)
					hrs.			
III		Allied Chemistry- I	19ACA	3	3	3	1	100
		Allied Practical	19AC1		3			
	II B.Sc.,	TOTAL		3	6		1	
IV		Allied Chemistry- II	19ACB	3	3	3	1	100
		Allied Practical	19AC1	4	3	3	1	100
TOTA	L			7	6		2	

*Allied optional – Mathematics/ Zoology.

Sem.	Class	Title of the Paper	Sub.Code.	Credit	No.	Exam	No. of	Total
					of	Hrs.	Paper	marks(25+75)
					hrs.			
III		Allied Chemistry- I	19ACA	3	3	3	1	100
		Allied Practical	19AC1		3			
	II B.Sc.,	TOTAL		3	6		1	
IV		Allied Chemistry- II	19ACB	3	3	3	1	100
		Allied Practical	19AC1	4	3	3	1	100
TOTA	L	<u>.</u>		7	6		2	

Allied Chemistry for II Physics , Botany, Zoology & Bio-Chemistry

*Allied optional – Mathematics/ Zoology.

BHARATHI WOMEN'S COLLEGE (AUTONOMOUS), CHENNAI – 108. P.G. DEPARTMENT OF CHEMISTRY

B.Sc., CHEMISTRY - MODEL QUESTION PAPER (MAJOR & ALLIED)

Time : 3 Hrs	Marks : 75
SECTION – A	
Answer ALL the questions:	10X2=20
(Without omitting any unit)	
SECTION – B	
Answer any FIVE questions out of seven:	5x5=25
SECTION – C	
Answer any THREE questions out of five:	3x10=30

BHARATHI WOMEN'S COLLEGE (AUTONOMOUS), CHENNAI – 108. P.G. DEPARTMENT OF CHEMISTRY

U.G – NON MAJOR ELECTIVE - MODEL QUESTION PAPER

5x10=50

Time : 3 Hrs	Mark : 75
SECTION – A	
Answer any FIVE questions out of seven:	5x5=25
SECTION – B	

Answer any **FIVE** questions out of eight:

BHARATHI WOMEN'S COLLEGE (AUTONOMOUS), CHENNAI – 108. B.Sc., CHEMISTRY PRACTICAL EXAMINATIONS (for students admitted from 2019-20) PRACTICAL – I

Time: 3 Hrs Code: 19CC1 Marks: 60

Practical – 50, Record-10.

You are given	solution.	Estimate	volumetrie	cally	the
amount of present in the	whole of	the given	solution.	You	are
provided with approximately 0.1N solution of	an	d pure			
Get the burette and balance readi	ngs atteste	d by the ex	kaminer.		

BHARATHI WOMEN'S COLLEGE (AUTONOMOUS), CHENNAI - 108. **B.Sc., CHEMISTRY PRACTICAL EXAMINATIONS**

(for students admitted from 2019-20)

PRACTICAL – I

Time: 3 Hrs Code: 19CC1 KEY

Marks: 60

Practical – 50, Record-10.

Substance to be estimated	Standard Solution	Link Solution
Mg^{2+}	MgSO ₄	EDTA

SCHEME OF VALUATION

Accuracy :

Error upto 2%	50 marks
Error upto 3%	45 marks

Error upto 4% 35 marks

Error upto 5% 25 marks

Error above 5% 20 marks.

1. For each independent arithmetical error deduct 2 marks.

2. For incomplete or wrong calculation deduct 20%

3. For no calculation deduct 40%

BHARATHI WOMEN'S COLLEGE (AUTONOMOUS), CHENNAI – 108. B.Sc., CHEMISTRY PRACTICAL EXAMINATIONS

(for students admitted from 2019-20)

PRACTICAL – II

Time: 3 Hrs Code: 19CC2 Marks : 60

Practical – 50, Record-10.

1. Analyze systematically the given inorganic mixture and report **TWO** acid radicals and **TWO** basic radicals. One of the acid radical being an interfering one. Recording your observations as and when you make them. (**35 marks**)

2. Starting from the given A and B prepare maximum amount of C. (15 marks)

BHARATHI WOMEN'S COLLEGE (AUTONOMOUS), CHENNAI – 108. B.Sc., CHEMISTRY PRACTICAL EXAMINATIONS

(for students admitted from 2019-20)

PRACTICAL – II

Time: 3 Hrs Code: 19CC2 Marks: 60

Practical – 50, Record-10.

KEY

1. Acid Radicals: Carbonate, Nitrate, Sulphate, Chloride, Phosphate, Oxalate and Borate.

Basic Radicals: Lead, Copper, Manganese, Nickle, Zinc, barium, Calcium, Strontium, Magnesium and Ammonium.

Preparation – Ferrous Ammonium Sulphate.

SCHEME OF VALUATION

1. Inorganic Qualitative Analysis – Systematic analysis with correct elimination and confirmatory tests.				
(30 Marks)				
4 radicals with procedure	30			
3 radicals with procedure	23			
2 radicals with procedure	15			
1 radical with procedure	08			
Spotting of radicals	2x4 = 8			
Group identification	3x2 = 6			
2 Preparation	(20 Marks)			
	(20 Warks)			
Quality	12			
2 million				
Quantity	08			

BHARATHI WOMEN'S COLLEGE (AUTONOMOUS), CHENNAI - 108. **B.Sc., CHEMISTRY PRACTICAL EXAMINATIONS**

(for students admitted from 2019-20)

PRACTICAL – III

Organic Analysis and Gravimetric Estimation				
Time: 6 Hrs	Marks : 60			
Code: 19CC3	Practical – 50, Record-10			

Systematically carry out suitable test on the given organic substance and report on the following.

	Ν	Iarks
i) Elements present or a	bsent?	(6)
ii) Whether aliphatic or aromatic?		(2)
iii) Whether saturated or	unsaturated?	(2)
iv) The nature of functio	nal group present in it	(6)
v) Confirmatory test and	l derivative	(4)
b) Prepare a pure sample of . and recrystallized sample.	from	the quantity ofsubmit the crude (10)
2. Estimate the amount ofas		present in the whole of the given solution of (30)
Error in %	Marks	
Error upto 2%	30	
Error upto 3%	25	
Error upto 4%	20	
Error upto 5%	15	
Above 5%	08	

- Among the duplicate results the Value more favourable to the candidate must be taken.
- If the two results differ by more than 2% deduct 2marks. •
- For each independent arithmetical error deduct 1mark •

BHARATHI WOMEN'S COLLEGE (AUTONOMOUS), CHENNAI – 108. B.Sc., PRACTICAL EXAMINATIONS (For UG students admitted from the academic year 2019-20 onwards) ALLIED CHEMISTRY PRACTICAL

Code: 19AC1

Marks: 60

Practical – 50, Record-10.

(50 marks)

1. You are given	۱			solution. Es	timate	vol	umetrically	the amount
of			pre	esent in the whole of the give	ven solu	ition.	You are pr	ovided with
approximately	0.1N	solution	of		and	а	solution	containing
	.grams o	ofp	er litı	e.				

Time: 3 Hrs

BHARATHI WOMEN'S COLLEGE (AUTONOMOUS), CHENNAI – 108. B.Sc., PRACTICAL EXAMINATIONS (For UG students admitted from the academic year 2019-20 onwards)

ALLIED CHEMISTRY PRACTICAL

Code: 19AC1 Marks : 60 Practical – 50, Record-10.

SCHEME OF VALUATION

1. Volumetric Analysis

Upto 1%	50
1- 2%	40
2 - 3%	30
3 - 4%	20
Above 4%	10

Time: 3 Hrs

(50 marks)