



SOURASHTRA COLLEGE, MADURAI- 625004
(An Autonomous Institution Re-accredited with 'B' grade by NAAC)
B.Sc. CHEMISTRY - SYLLABUS
(Under CBCS w.e.f. 2017 - 2018 onwards)

276

I SEMESTER

S. No	PART	Sub. Code	Subject Title	Hrs/ Wk	Exam hrs	C A	SE	Tot	Crd
1	PART - I	17UACT11/ H11/S11	Tamil/Hindi/ Sanskrit	6	3	25	75	100	3
2	PART - II	17UACE11	English	6	3	25	75	100	3
3	PART - III CORE	17UCYC11	Inorganic Chemistry - I	5	3	25	75	100	4
4	PART - III CORE		Inorg. sm qual. Analysis	2	0	0	0	0	0
5	PART - III ALLIED	17UMSA11/ 17UBYA11	Maths/Botany	6	3	25	75	100	5
6	PART - IV SBS	17UCYS11	Laboratory techniques	3	3	25	75	100	3
7	PART - IV	14UACVE1	Value Education	2	3	25	75	100	2
Total				30					20

Passed in the BOS Meeting
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PART - III CORE	Title : INORGANIC CHEMISTRY- I	Subject Code : 17UCYC11
Semester : I	HOURS : 5 hours / Week	CREDITS :4

Objectives

To acquire the knowledge of constituents of atom, union of atoms, the position, properties and metallurgical process of elements. To understand chemistry of nucleus.

UNIT - I STRUCTURE OF ATOM (15 hrs)

An outline of constituents of atom (elementary idea) –Model of atom : Rutherford and its drawbacks - Quantum theory: Photoelectric effect – Compton effect - Bohr model of atom: postulates – Bohr's radius and energy of electron (no derivation) - Origin of hydrogen spectrum – dual character of electron – Heisenberg's uncertainty principle - Quantum numbers – Pauli's exclusion principle – Aufbau principle- Hund's rule – electronic configuration of atoms.

UNIT - II PERIODIC TABLE AND ATOMIC PROPERTIES (15 hrs)

Modern Periodic Table – its salient features – classification and characterization of s, p, d and f block elements – periodicity and its causes - atomic properties: atomic radii, ionic radii, ionization energy, electron affinity and electronegativity – Factors governing them and their periodic – scales of electronegativity : Pauling, Mulliken and Allred & Rochow – applications of electronegativity.

UNIT - III CHEMICAL BONDING (15 hrs)

Cause of chemical bonding - Octet rule - Ionic bond – Covalent bond – Valence Bond approach – its limitations – Fajan's rule – VSEPR theory : Postulates and applications – hybridization – sp , sp^2 , sp^3 , sp^3d and sp^3d^2 (BeF_2 , BCl_3 , CH_4 , PCl_5 , SF_6) – Molecular Orbital theory – LCAO method - MO diagram for homonuclear and heteronuclear diatomic molecules – H_2 , He_2 , Li_2 , Be_2 , B_2 , C_2 , N_2 , O_2 , F_2 , CO , NO and HF – determination of magnetic property and bond order.



UNIT - IV NUCLEAR CHEMISTRY

(15 hrs)

Fundamental particles of nucleus – Nuclides – concept – isotope, isobar and isotones – nuclear forces – nuclear stability: Meson theory, Liquid drop model, shell model and n/p ratio – binding energy – mass defect – packing fraction – natural radioactivity - artificial radioactivity – nuclear reactions: spallation, nuclear fission and nuclear fusion – radioactive isotopes and its applications in medicine, agriculture, archaeology, biology and analytical chemistry.

UNIT - V METALLURGY

(15 hrs)

Occurrence of metals – minerals – ores - types of ores – various steps involved in metallurgy- concentration of ore : physical and chemical methods - calcination - roasting - reduction methods : smelting, alumino-thermic, air and electrolytic methods - refining methods : cupellation, electrolytic, zone refining and vapour phase method.

Extraction of Vanadium, Molybdenum and Tungsten from their ores.

Text books:

1. Principles of Inorganic Chemistry by Puri, Sharma & Kalia, Milestone publisher & distributor (2009).
2. Text book of Inorganic Chemistry by P. L. Soni and M. Katyal, 20th Edition, Sultan chand & Sons (2013).

Reference books:

1. Concise Inorganic Chemistry by J.D. Lee, 5th Edition, Wiley India (2009).
2. Modern Inorganic Chemistry by R.D. Madan S. Chand and Co. Ltd. (2012).
3. UGC Inorganic Chemistry-I by H. C. Khera, 3rd Edition, Pragati Prakashan (2012).



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PART - IV SBS	Title:LABORATORY TECHNIQUES - Principles & Practice	Subject Code : 17UCYS11
Semester : I	HOURS : 3 hours / Week	CREDITS :3

Objectives

To get awareness on laboratory chemicals and safety, to acquire the thorough knowledge about solutions, to know the principles of inorganic qualitative analysis and knowledge about volumetric titrimetry principles.

To know about separation and purification techniques.

UNIT - I LABORATORY HYGIENE AND SAFETY (9 hrs)

Storage and handling of chemicals – Carcinogenic chemicals – Toxic and poisonous chemicals – Waste disposal – Fume disposal – General precautions for avoiding accidents – First aid techniques – Poisoning – methods to avoid poisoning – Treatment for specific poison–antidotes– Laboratory safety measures.

UNIT - II SOLUTIONS (9 hrs)

Ways of expressing concentration : molarity – molality - normality – percentage - numerical problems based on these. Acids and bases: Arrhenius, Bronsted and Lowry, Lewis and Lux-Flood – relative strength of acids and bases.pH of solutions: pH scale and numerical problems based on it. Buffer solutions: definition and types – calculation of pH by Henderson equation – biological importance.

UNIT - III INORGANIC QUALITATIVE ANALYSIS (9 hrs)

Aims of semi micro methods – Types of reactions – dry reactions – precipitation reactions – complexation reactions – oxidation and reduction reactions – Flame test, borax bead test, charcoal cavity test and cobalt nitrate test - chemistry of interfering anions and their removal in the analysis of cations: oxalate, borate, fluoride, phosphate and chromate – solubility product principle and its applications in the separation of cations.



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UNIT - IV VOLUMETRIC ANALYSIS (9 hrs)

TITRIMETRY : Titration – analyte and titrant – equivalence point – standard solutions: primary and secondary standards – volumetric titrations: types – acid-base titrations (choice of indicator and its theory) – redox titrations (permanganometry, iodometry and iodimetry) and complexometric titrations (EDTA only).

UNIT - V PURIFICATION TECHNIQUES (9 hrs)

Purification Methods: Types – criteria of purity - principle – detailed study of crystallisation – sublimation - distillation and its types (steam, fractional and reduced pressure distillations) – extraction techniques.

Text books:

1. Elements of Analytical Chemistry by R.Gopalan, P.S.Subramanian and K.Rengarajan, Sultan Chand & Sons, (2000)
2. Principles of Inorganic Chemistry by Puri, Sharma & Kalia, Milestone publisher & distributor (2009).

Reference books:

1. Vogel's textbook of Quantitative Inorganic Analysis 4th edition.(1978)
2. Essentials of Physical Chemistry by B.S.Bahl, Arun Bahl and G.T.Tuli - S.Chand and Co.Ltd., (2012)
3. Basic Principles of Practical Chemistry by V.Venkateswaran,R.Veerasingam & A.R.Kulandaivelu, Sultan Chand & sons, (2002)

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II SEMESTER

S. No	PART	Sub. Code	Subject Title	Hrs/ Wk	Exam hrs	C A	SE	Tot	Crd
1	PART – I	17UACT21/ H21/S21	Tamil/Hindi/ Sanskrit	6	3	25	75	100	3
2	PART – II	17UACE21	English	6	3	25	75	100	3
3	PART – III CORE	17UCYC21	Physical Chemistry -I	5	3	25	75	100	4
4	PART – III CORE	17UCYCP1	Inorg. sm qual. Analysis	2	3	40	60	100	2
5	PART – III ALLIED	17UCYA21	Maths/Botany	6	3	25	75	100	5
6	PART – IV SBS	17UCYS21	Applied chemistry – I	3	3	25	75	100	3
7	PART – IV	14 UACES1	EVS	2	3	25	75	100	2
Total				30					22

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PART - III CORE	Title : PHYSICAL CHEMISTRY – I	Subject Code : 17UCYC21
Semester : II	HOURS : 5 hours / Week	CREDITS :4

Objectives

To acquire a thorough knowledge of the three states of matter with colloids and interaction of matter on surface.

UNIT – I GASEOUS STATE (15hrs)

Gas Laws – Ideal gas equation - kinetic theory of gases : Postulates – derivation of ideal gas laws – deviations - Vander Waals' equation - Maxwell distribution of molecular velocities (no derivation) - graphical representation – effect of temperature on various velocities – Law of corresponding states – Boyle and inversion temperatures of gases.

Mean free path – viscosity of gases – collision number – Brownian movement – Avogadro number – determination of avogadro number – Loschmidt number – principle of equipartition energy.

UNIT – II LIQUID STATE (15 hrs)

Intermolecular forces in liquids – dipole-dipole attractions, London forces and hydrogen bonding - Heat of vapourisation - Trouton's rule and its significance – molar volume and its applications – surface tension - effect of temperature on surface tension – parachor – atomic and structural parachors - their applications- viscosity – effect of temperature on viscosity – measurement of viscosity – Ostwald method - Reynold's number. Liquid Crystals – classification – smectic – nematic - cholesteric - disc shaped and polymer liquid crystals – LCDs and the Seven Segment cell - applications.

UNIT – III SOLID STATE (15 hrs)

Introduction – types of solids: amorphous and crystalline solids - size and shape of crystals – symmetry of crystals – law of rational indices - space lattice and unit cells – types of unit cells – Miller indices- Bragg's equation –derivation- measurement of diffraction angle : rotating crystal method– Ionic crystals : sodium chloride, caesium chloride – crystal defects : vacancy defect, interstitial defect and impurity defect.



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UNIT – IV SURFACE CHEMISTRY (15 hrs)

Catalysis : Definition – characteristics of catalytic reactions –Homogeneous catalysis : Acid-base catalysis-enzyme catalysis-Michaelis-Menten equation-autocatalysis-Heterogeneous catalysis – surface catalytic reactions – promoters- catalytic poison – theories of catalysis .

Adsorption : Definition – various terms involved in adsorption – types of adsorption : physical and chemical adsorption – difference between them - factors influencing adsorption–Adsorption Isotherms: Freundlich adsorption isotherm and Langmuir adsorption isotherm- derivation - applications of adsorption.

UNIT – V COLLOIDS (15 hrs)

Definition – classification- lyophilic and lyophobic sols – comparison between them – preparation of sols – dispersion methods: Bredig's Arc , peptization methods – aggregation methods – Purification of sols: dialysis – Optical properties of sols:Tyndall effect – Kinetic properties of sols: Brownian movement – Electrical properties of sols : Electrophoresis – Gold number –Emulsions: definition – types – Gels: definition - types – applications of colloids .

Text books:

1. Principles of Physical Chemistry by B. R. Puri, L. R. Sharma & S. Pathania, Vishal Publishing Co. (2011).
2. Text book Physical Chemistry by P.L.Soni, O.P.Dharmarha & U.N.Dash,S.Chand,(2011)

Reference books:

1. Essentials of Physical Chemistry by B. S. Bahl, Arun Bahl and G. D. Tuli, S. Chand and Co. Ltd. (2012).
2. Advanced Physical Chemistry by D. A. Bajpai, S. Chand and Co. Ltd. 3rd Edition.
3. A text book of Physical Chemistry by S. Glasstone, Macmillan (India) Ltd. (1976).



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PART - IV SBS	Title: APPLIED CHEMISTRY-I	Subject Code : 17UCYS21
Semester : II	HOURS : 3 hours / Week	CREDITS :3

Objectives

To know the chemistry of water, fertilizers, cement, ceramics, fireworks, explosives, paints and pigments.

UNIT – I WATER TREATMENT (9 hrs)

Characteristics of water – hardness of water: types – unit and its estimation – removal of hardness – industrial implications - elementary study of water parameters like acidity, alkalinity, pH, DO, TDS, BOD, COD- treatment of water for domestic supply – treatment of sewage water.

UNIT – II AGRO CHEMICALS (9 hrs)

Fertilizers : role of macro nutrients in plant growth- requisites of a good fertilizer — manufacture and uses of urea, super phosphate of lime, muriate of potash and mixed fertilizers - adverse effects of fertilizers on the environment. Pesticides: Definition and classification – Insecticides: Manufacture and uses of Bordeaux mixture, DDT, BHC - Modern insecticides : organophosphorous and carbamates.

UNIT –III SILICATE INDUSTRY (9 hrs)

Cement: composition – manufacturing process – setting of cement – white cement – concrete. Glass : Raw materials – manufacturing process – characteristics - types of glasses. Ceramics : Raw materials - Permeable and impermeable wares – manufacturing process - plasticity of clays – white pottery glazing - earthenwares and stonewares – optical fibres.

UNIT –IV MATCH INDUSTRY, PYROTECHNY AND EXPLOSIVES (9 hrs)

Match Industry: Classification - match head and striking surface – manufacture of safety matches- chemistry of lighting of match stick.

Pyrotechny: composition of fireworks – coloured smokes – coloured matches.

Explosives: Classification – preparation and applications of gun powder, smokeless powder, lead azide, mercury fulminate, TNT,GTN, picric acid and dynamite.

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UNIT –V PAINTS AND PIGMENTS

(9 hrs)

Paints : Ingredients - characteristics of good paint - manufacture – setting of paints - paint failure . Pigments: Elementary study of zinc white, lithophone, ultramarines, carbon black, red lead and chrome green. Varnishes : manufacture – enamels – lacquers – solvents and thinner – oils.

Text books:

1. Industrial Chemistry by B. K. Sharma Goel publishing House (2008).
2. Applied Chemistry by K. Bagavathi Sundari, MJP publishers (2008).

Reference books:

1. Fundamental concepts of Applied Chemistry by Jeyashree Ghosh, S. Chand and Co. Ltd. (2006).
2. Principles of Inorganic Chemistry by Puri, Sharma & Kalia, Milestone publisher & distributor (2009).
3. Text book of Inorganic Chemistry by P. L. Soni and M. Katyal, 20th Edition, Sultan chand & Sons (2013).



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SEMESTER - III

No	PART	Sub. Code	Subject Title	Hrs/ Wk	Exam (hrs)	CA	SE	Tot	Crd
1	PART- I	17UACT31/ H31/S31	Tamil/Hindi/ Sanskrit	6	3	25	75	100	3
2	PART-II	17UACE31	English	6	3	25	75	100	3
3	PART-III Core	17UCYC31	Organic Chemistry -I	5	3	25	75	100	4
4	PART-III Core		Volumetric Estimation (Practicals)	2	0	0	0	0	0
5	PART-III Allied	17UPS A31	Allied subject - II Physics	4	3	25	75	100	4
6	PART-III Allied		Allied subject - II Physics (Practicals)	2	0	0	0	0	0
7	PART-IV SBS	17UCYS31	Applied Chemistry - II	3	3	25	75	100	3
8	PART-IV N M E	17UCYN31	Chemistry for Human Welfare - I	2	3	25	75	100	2
			Total	30					19

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PART - III	Title : ORGANIC CHEMISTRY-I	Subject Code :
CORE		17UCYC31
Semester : III	HOURS : 5 hours / Week	CREDITS :4

Objectives

To have a thorough knowledge of basic principles of organic reactions, a detailed study of aliphatic hydrocarbons and aromatic hydrocarbons. To acquire the knowledge of various types of reactions in aromatic and aliphatic compounds with their orientation. To study a detailed and comparative study of halogenated and hydroxyl compounds of both aromatic and aliphatic nature.

Unit I Basic concepts of organic chemistry (15 hrs)

- Characteristics of organic compounds – catenation – classification of organic compounds – homologous series – functional groups – nomenclature – IUPAC system – Empirical formula – molecular formula – problems.
- Tetrahedral valency of carbon – homolytic and heterolytic fissions of C-C bond – formation and stability of carbonium ions, carbanions and free radicals – electrophilic and nucleophilic reagents.
- Electronic effects : inductive effect – mesomeric effect – electromeric effect - resonance effect – hyperconjugation effect.
- Types of organic reactions – substitution – addition – elimination – rearrangement – examples (mechanism not required).

Unit II Aliphatic hydrocarbons (15 hrs)

- Alkanes** : Preparation by Sabatier-Senderen, Wurtz, Corey-House, Kolbe, Duma and reduction methods – General properties.
- Alkenes** : General methods of preparation - general properties – regioselectivity in addition reactions viz., syn- and anti, Markovnikov rule and Kharasch effect – detection and location of double bond – simple problems - preparation and properties of 1,3-butadiene.
- Alkynes** : General methods of preparation – properties - acidic character of acetylene – structure.

Unit III Aromatic compounds (15 hrs)

- Introduction – sources – characteristics . Benzene: structure – Kekule and Molecular orbital models. Aromaticity – Huckel's rule – its applications – Non aromatic and anti-aromatic compounds.
- Aromatic electrophilic substitution reactions – mechanisms, orientation effect and reactivity – Disubstitution : directive influence of substituents - Trisubstitution : rules and steric hinderence.
- Aromatic nucleophilic substitution : unimolecular, bimolecular and benzyne mechanisms.

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Unit IV Organo halogen compounds (15 hrs)

- Alkyl halides** : General methods of preparation – general properties – detailed mechanisms of nucleophilic substitution and elimination reactions. Fluorocarbons: Westron and Freon – preparation, uses and their impact on environment.
- Aryl halides** : Preparation by halogenation, Sandmeyer and Hunsdiecker reactions – general properties – halogenated insecticides: preparation, uses of BHC and DDT.
- Aralkyl halides** : Benzyl chloride – preparation and properties – comparison between aryl halide and aralkyl halide.

Unit V : Organo hydroxy compounds (15 hrs)

- Alcohols** : Preparation from alkenes by hydration, hydroboration-oxidation and oxymercuration-demercuration methods – general properties. Ethylene glycols: Preparation and properties – Glycerol : Preparation and properties – Nitroglycerins and their applications.
- Phenols** : General methods of preparation – properties – acidity of phenol and effect of substituents – reactions of analytical importance.
- Aromatic alcohol** : Benzyl alcohol - Preparation and properties – comparison with phenols.

Text books:

- Modern Organic Chemistry by M.K.Jain and S.C.Sharama, Vishal Publishing co. 4th edn. (2014)
- A Text book of Organic Chemistry by K.S. Tewari and N. K. Vishnoi - Vikas Publishing House pvt. Ltd. 3rd Edn. (2006)

Reference books:

- Organic Chemistry by I.L.Finar (Volume I) Pearson Education Ltd. (2012)
- Advanced Organic Chemistry by Arun Bahl and B. S. Bahl, S. Chand Publishing (2014)
- Organic Chemistry by Bhupinder Mehta and Manju Mehta ,Eastern Economy Edition,(2010)

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PART - IV SBS	Title : APPLIED CHEMISTRY - II	Subject Code : 17UCYS31
Semester : III	HOURS :3 hours / Week	CREDITS :3

Objectives

To know the chemistry of milk with their milk products, foods, sugar, paper and petrochemicals.

UNIT – I DAIRY CHEMISTRY (9 hrs)

Milk – constituents of milk – physical properties of milk – effects of heating - pasteurization and its types. Types of milk: homogenized milk – flavoured milk – vitaminised milk - toned milk and condensed milk (elementary idea only). Milk products: elementary idea about Cream, Butter , Ghee , Ice cream and milk powder.

UNIT – II FOOD CHEMISTRY (9 hrs)

Introduction – general characteristics, composition, energy values of foods – Basal Metabolism Rate – Food additives, Food flavours and Food pigments : an elementary idea – preliminary study Food deterioration and Food preservatives - Adulterants : definition, classification, ill-effects and prevention – certification of food products.

UNIT –III SUGAR TECHNOLOGY (9hrs)

Sources – manufacture of cane sugar: Extraction of juice, purification by defecation, sulphitation and carbonation, concentration, crystallization, separation and refining – manufacture of sucrose from beet root - testing of sugar.

UNIT –IV PAPER INDUSTRY (9 hrs)

Introduction – various raw materials – manufacture of pulp: mechanical and chemical process – rag pulp – beating, refining, filling, sizing and colouring – manufacture of paper - calendering.

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UNIT –V PETROCHEMICALS

(9 hrs)

Crude oil – fractional distillation - chemicals from crude oil – natural gas – LPG – aviation fuel – fuels used in locomotives – trucks and ships – fuels used in light commercial vehicles – octane number and cetane number – anti knocking agents.

Text books:

1. Industrial Chemistry by B. K. Sharma Goel publishing House (2008).
2. Applied Chemistry by K. Bagavathi Sundari, MJP publishers (2008).

Reference books:

1. Fundamental concepts of Applied Chemistry by Jeyashree Ghosh, S. Chand and Co. Ltd. (2006).
 2. Advanced Organic Chemistry by Arun Bahl and B. S. Bahl, S. Chand Publishing (2014)
 3. Food Science by Norman N.P. & Joseph H.H, 5th edition ,CBS pub.& dist.,(1997)
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PART - IV NME	Title: CHEMISTRY FOR HUMAN WELFARE –I	Subject Code : 17UCYN31
Semester : III	HOURS : 2 hours / Week	CREDITS : 2

Objective

To acquire the knowledge about the water and sewage treatment methods, chemicals used in day-today life viz., nutrients in food and agriculture, polymers and some house hold products.

Unit I Water Quality analysis and Sewage treatment (6 hrs)

Water : types – soft and hard water - an elementary idea about the parameters viz., : pH, acidity, alkalinity, total dissolved solids (TDS), hardness, Dissolved oxygen (DO), Biochemical oxygen demand (BOD), Chemical oxygen demand (COD) – Sea water as a source of drinking water: RO method

Sewage treatment: An outline of stages involved – Methods of treatment: Imhoff tanks and Anaerobic lagoons.

Unit II Food Chemistry (6 hrs)

The meaning of Food – nutrients – classification of food –functions of food – Nutritional sources and examples of carbohydrates, proteins, lipids and vitamins – mal nutrition and good nutrition. Milk: composition – effect of heat – Pasteurization- homogenized milk – milk powder.

Unit III Agricultural Chemistry (6 hrs)

Fertilizers: Definition – micro and macro nutrients - their roles in plant growth – requirements of a good fertilizer – natural fertilizer : manures - chemical fertilizers : urea, super phosphate and mixed fertilizer (No preparation, only applications).

Insecticides and Pesticides: Definition – examples viz., DDT, Paris green, BHC, Bordeaux mixture and carbamates (No preparation, only applications).



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Unit IV Polymer Chemistry

(6 hrs)

Polymer : Definition – types – Rubber : types and its uses – synthetic polymers : PE, PVC, polyester, Dacron, Nylon and Teflon (No preparation and only applications).
Resins and Plastics : Definition, examples and distinction between them.

Unit V House hold products

(6 hrs)

Preparation of the following house hold products and their ill effects : washing powder, cleaning powder, phenoyls, fountain pen inks, soap oil, shampoo, pain balm, incense sticks and candles.

Text Books :

1. Materials prepared by the Department of Chemistry, Sourashtra College, Madurai.
2. Fundamental Concepts of Applied Chemistry by Jayashree Ghosh, S.Chand & Co. Ltd, (2013)

Reference books :

1. Engineering Chemistry by Jain and Jain, Dhanpat Raj Publishing Co. Pvt. Ltd. (2007)
2. Industrial Chemistry– B.K.Sharma – Goel Publishing House. 13th Edition (2008)
3. Food Chemistry by Alex V Ramani, MJP Publishers,(2009)



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SEMESTER -IV

No	PART	Sub. Code	Subject Title	Hrs/ Wk	Exam (hrs)	CA	SE	Tot	Crd
1	PART- I	17UACT441 /H41/S41	Tamil/Hindi/ Sanskrit	6	3	25	75	100	3
2	PART-II	17UACE41	English	6	3	25	75	100	3
3	PART-III Core	17UCYC41	Inorganic Chemistry - II	5	3	25	75	100	4
4	PART-III Core	17UCYCP2	Volumetric Estimation (Practicals)	2	3	40	60	100	2
5	PART-III Allied	17UPS A41	Allied subject-II Physics	4	3	25	75	100	4
6	PART-III Allied	17UPS AP1	Allied subject-II Physics (Practicals)	2	3	40	60	100	2
7	PART-IV SBS	17UCYS41	SBS- IV Applied Spectroscopy and Computer applications in Chemistry	3	3	25	75	100	3
8	PART-IV NME	17UCYN41	Chemistry for Human Welfare - II	2	3	25	75	100	2
9	PART-V		Extension Activities					100	1
			Total	30					24

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PART - III CORE	Title : INORGANIC CHEMISTRY-II	Subject Code : 17UCYC41
Semester : IV	HOURS : 5 hours / Week	CREDITS :4

Objectives : *To acquire the knowledge of chemistry of s and p -block elements for their general characteristics with comparative studies among group elements and applications of the industrially important compounds. To have an idea about non –aqueous solvents & learn about hard and soft concepts of acids and bases.*

Unit –I s - Block Elements

(15 hrs)

- Hydrogen: Occurrence – preparation- isotopes & its applications – hydrides – types- preparation –properties – uses.
- Group 1 Elements: General characteristics : Electronic configuration, metallic character, flame colouration, oxidation state and reducing property – Anomalous properties of Lithium –Diagonal relationship and resemblance of Li & Mg – causes – Preparation, Properties and uses of Lithium carbonate, Sodium hydroxide and Potassium iodide.
- Group 2 Elements: General characteristics : Electronic configuration, metallic character, flame colouration, oxidation state and reducing property – Anomalous behaviour of Be – Diagonal relationship of Be & Al. - Preparation and properties and uses of Beryllium chloride, Magnesium sulphate, Calcium carbide and Barium sulphate – Uses of Radium salts.

Unit –II p - Block Elements – I

(15 hrs)

- Group 13 Elements: General characteristics : Electronic configuration, metallic character, oxidation states, formation of trihalides and hydrides - Diagonal relationship of B & Si - Preparation, properties and uses of Diborane, Borax, Borazine and $AlCl_3$ – Structure of Diborane, BF_3 and $AlCl_3$ – Ceramics industry : manufacture of Whiteware.
- Group 14 Elements: General characteristics : Electronic configuration, allotropy, metallic and non-metallic character, oxidation states and catenation – allotropes of carbon – detailed study of Carbides and Silicates – Preparation, properties and uses of Silicones, Carborundum, Stannous chloride, Red Lead and White Lead.

Unit –III p - Block Elements – II

(15 hrs)

- Group 15 Elements:- General characteristics : Electronic configuration, metallic and non-metallic character, allotropy, oxidation states and catenation - Nitrides: classification - Allotropic modifications of phosphorus – Difference between red and white phosphorus – metalloid character of Arsenic – alloys of bismuth – preparation, properties and uses of microcosmic salt, Graham's salt and tartar emetic.
- Group 16 Elements: General characteristics : Electronic configuration, metallic and non-metallic character, atomicity, polymorphism, catenation and oxidation states – Anomalous behavior of oxygen - Uncommon feature of liquid sulphur- unique feature of SF_4 – preparation, properties and uses of Caro's acid and Marshall's acid – Properties of selenium, Tellurium and Polonium.

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Unit –IV p - Block Elements – III

(15 hrs)

Group 17 Elements: General characteristics : Electronic configuration, colour, oxidation states, non-metallic character, electronegativity and electron affinity – isolation of fluorine by modern method – peculiarities of fluorine – hydrides of halogens : comparative studies – study of oxides of iodine - oxyacids of halogens: preparation, properties and structure of hypochlorous acid - bleaching powder : its manufacture (Modern method) and estimation of available chlorine in bleaching powder – perhalic acids : study of perchloric acid and periodic acid – relative strengths of oxoacids of the halogens - electropositive character of Iodine – detailed study of iodometry and iodimetric titrations - Interhalogens: types – preparation and properties of ICl, BrF₃, ClF₅ and IF₇– Pseudohalogens – preparation, properties of cyanogens and thiocyanogen.

Unit –V Noble gases and Non-aqueous solvents

(15 hrs)

- a) Group 18 Elements: occurrence – general characteristics - isolation of noble gases from dry air – separation by Dewar's coconut charcoal method – study of compounds of noble gases: preparation, properties and structure of XeF₄, XeOF₄ and KrF₂ – study of clathrates.
- b) Non-Aqueous Solvents: Classification and characteristic properties of solvents – detailed study of liquid ammonia and liquid HF- comparison of liquid ammonia and water – an elementary study of molten salts as non-aqueous salts.
- c) Hard and soft acids and bases : Pearson's concept – HSAB principle and its applications.

Text books:

1. Principles of Inorganic Chemistry by Puri, Sharma and Kalia, Milestone Publisher 2013.
2. Modern Inorganic Chemistry by R. D. Madan and Satya Prakash, S. Chand and Co, 3rd edn. 2014.

Reference Books:

1. Inorganic Chemistry by J. E. Huheey et. al, Pearson Education Pvt. Ltd., 4th edn. 2004.
2. Advanced Inorganic Chemistry by F. A. Cotton and G. Wilkinson, John Wiley and sons Inc., 6th edn. 2006.
3. Inorganic Chemistry: A Unified Approach by W.W. Porterfield, Academic Press, California 2nd edn 2005



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PART - IV SBS	Title : APPLIED SPECTROSCOPY AND COMPUTER APPLICATIONS IN CHEMISTRY	Subject Code : 17UCYS41
Semester : IV	HOURS : 3 hours / Week	CREDITS :3

Objectives

- ❖ *To get knowledge about the analysis of organic molecules using UV-Vis, IR and NMR Spectroscopy .*
- ❖ *To get knowledge about basic C language and its applications in chemistry*

Unit I SPECTROSCOPY - I

(9 hrs)

Spectroscopy : Introduction – merits. Electromagnetic spectrum – spectroscopic techniques in the study of molecules. **UV-Visible spectroscopy** : Principle – instrumentation – presentation of spectrum - types of electronic transitions- chromophore and auxochrome concepts - absorption and intensity shifts - Woodward-Fieser rules for calculating absorption maximum for conjugated dienes and - α,β unsaturated carbonyl compounds - Applications.

Unit –II SPECTROSCOPY – II

(9 hrs)

Infra-red spectroscopy : Principle - instrumentation - sampling – stretching and bending r vibrations - vibrational frequency – factors influencing vibrational frequencies: fermi-resonance, electronic effects and hydrogen bonding - Finger-print region - major bands for different classes of organic compounds - Applications.

Unit –III SPECTROSCOPY - III

(9 hrs)

Nuclear Magnetic Spectroscopy : Principle - instrumentation - solvents and reference chemicals - number of signals - chemical shift : definition and factors affecting chemical shift -shielding, deshielding, resonance and anisotropy effects - proton counting - splitting of signals – spin-spin coupling and coupling constant – Interpretation of PMR spectra of the following molecules : n- Propanol, p-anisidine, benzaldehyde, ethylacetate and α -bromo butanoic acid.

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Unit –IV C-programming in Chemistry - I

(9 hrs)

C language : History - Important features of 'C' - steps involved in 'C' program - C tokens - Operators (Arithmetic, Assignment, Comparison, Logical) - Header Files – stdio.h – conio.h - math.h –data input – scanf function – data output – print function - **C programs in Chemistry** : Half life period calculation, Normality, Molality and Molarity Calculations.

Unit – V C-programming in Chemistry - II

(9 hrs)

Control Statements – If statement – If -else statement – Repetition Control Statements – While-loop statement – do-while statement - **C programs in Chemistry** : Calculation of RMS velocity, pH calculation from H^+ concentration and finding acidic,basic or neutral nature and calculation of Vander Waals constants 'a' and 'b'.

Text Books:

1. Modern Organic Chemistry by M.K.Jain and S.C.Sharama,Vishal Publishing co.4thedn. (2014)
2. Computers in Chemistry by K. V. Raman, Tata McGraw-Hill Publishing company Ltd. 2005.

Reference Books:

1. Elementary Organic Spectroscopy by Y.R.Sharma – S Chand & Co,5th revised Ed.,2013.
2. Spectrometric identification of Organic Compounds by R.M.Silverstein and G.C.Bassler – Wiley, 1964.
3. Computers for Chemists by Pundir and Bansal – Pragati Prakashan Publishers 2007.



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PART - III CORE	Title : Volumetric Estimation (Practicals)	Subject Code : 17UCYCP2
Semester : IV	HOURS : 2 hours / Week	CREDITS :2

Objective

To practice the quantitative estimation of substances by titration methods.

A double titration involving the making up of the solution to be estimated and the preparation of a primary standard solution.

LIST OF EXPERIMENTS:

- I. **ACIDMETRY AND ALKALIMETRY**
 - 1. Estimation of Na₂CO₃
 - 2. Estimation of NaOH/KOH
 - 3. Estimation of Oxalic acid.
- II. **REDOX TITRATIONS**
 - a. **Permanganimetry**
 - 1. Estimation of ferrous ion
 - 2. Estimation of Oxalic acid
 - 3. Estimation of calcium(direct method)
 - b. **Dichrometry**
 - 1. Estimation of ferrous ion
 - 2. Estimation of ferric ion using external indicator
- III. **IODOMETRY AND IODIMETRY**
 - 1. Estimation of potassium dichromate
 - 2. Estimation of potassium permanganate
 - 3. Estimation of copper
- IV. **EDTA Titration**
 - 1. Estimation of Hardness of water using EDTA.
 - 2. Estimation of Calcium.
 - 3. Estimation of Magnesium

Distribution of Marks: Internal - 40 Marks , External - 60 Marks

<u>Internal</u>		<u>External examination</u>	
Class Experiments	: 30 marks	Record Notebook	: 10 marks
Viva-voce	: 10 marks	Procedure writing	: 10 marks
Total	: 40 marks	Experiment	: 40 marks
		Total	: 60 marks

For Estimation, if the student has

- < 1% error - 40 marks
- 1-2% error - 30 marks
- 2-3% error - 20 marks
- 3-5%error - 10 marks
- > 5% error - 8 marks



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PART - IV NME	Title: CHEMISTRY FOR HUMAN WELFARE –II	Subject Code : 17UCYN41
Semester : IV	HOURS : 2 hours / Week	CREDITS : 2

Objective

To acquire the knowledge about the chemistry of matches, explosives, building materials, paints, medicines, chemistry & cosmetics used in day-to-day life.

Unit I Match Industry and explosives

(6 hrs)

Safety matches : definition – raw materials – outline of the manufacture. Pyrotechny: composition of fireworks – coloured smokes – coloured matches. Explosives: Definition – classification, examples with their applications.

Unit II Silicate Industry

(6 hrs)

Cement : raw materials – outline of the manufacture – setting of cement – curing. Glass : raw materials – outline of the manufacture – varieties of glass with their uses. Refractories : Definition and classification with their uses . Abrasives : Definition, classification, examples with their uses.

Unit III Paint Industry

(6 hrs)

Paints : Ingredients - characteristics of good paint – outline of the manufacture – setting of paints - paint failure . Pigments: white, yellow, red, blue, green and black pigments. Varnishes , enamels and lacquers.

Unit IV Pharmaceutical Chemistry

(6 hrs)

Drugs : definition and its sources – Explanation and any two examples of the following drugs : antibiotics, antiseptics, anaesthetics, antipyretic analgesics, anti-inflammatory agents , sedatives and hypnotics, anticonvulsants, muscle relaxants, diuretics, expectorants and antitussives, cardio vascular drugs, steroids and antineoplastic agents.

Unit V Cosmetics

(6 hrs)

Explanation and necessity- classification – skin care: cold and vanishing creams - Make-ups: face powder, lipsticks, rouge, mascara and hair cosmetics.

Text Book:

1. Materials prepared by the Department of Chemistry, Sourashtra College, Madurai.
2. Fundamental Concepts of Applied Chemistry by Jayashree Ghosh, S.Chand & Co. Ltd, (2013)

Reference books :

1. Engineering Chemistry by Jain and Jain, Dhanpat Raj Publishing Co. Pvt. Ltd. (2007)
2. Industrial Chemistry by B.K.Sharma, Goel Publishing House. 13th Edition (2008)
3. Medicinal Chemistry by Ashutouh Kar, New Age International (P) Ltd. (2007)

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SEMESTER - V

S.No	Sub. Code	Subject Title	Hrs/ Wk	Exam (hrs)	CA	SE	Tot	Crd
1	17UCYC51	Core - 7 Inorganic Chemistry – III	5	3	25	75	100	5
2	17UCYC52	Core - 8 Organic Chemistry – II	5	3	25	75	100	5
3	17UCYC53	Core-9 Physical Chemistry – II	6	3	25	75	100	5
4	17UCYMP3	Core – 10 P Physical Chemistry Experiments	6	6	40	60	100	5
5	17UCYMP4	Core – 11 P Organic Estimation and preparation	3	6	40	60	100	2
6	17UCYE51 [#]	Elective-1 Analytical Chemistry & Green Chemistry	5	3	25	75	100	5
7	17UCYE52 [#]	Elective – 2 Chemistry of Materials	5	3	25	75	100	5
8	16USSS51	Soft Skills	-	-	-	-	100	0

[#] students to choose one among the two elective papers

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SEMESTER – VI

S.No	Sub. Code	Subject Title	Hrs/ Wk	Exam (hrs)	CA	SE	Tot	Crd
1	17UCYC61	Core - 12 Physical Chemistry – III	5	3	25	75	100	5
2	17UCYC62	Core - 13 Organic Chemistry – III	5	3	25	75	100	5
3	17UCYC63	Core - 14 P Gravimetric Estimation and Inorganic complexes preparation	6	3	25	75	100	5
4	17UCYMP5	Core – 15 P Organic Analysis	6	6	40	60	100	5
5	17UCYMP6	Core - 16 viva-voce Objective Chemistry	3	6	40	60	100	2
6	17UCYE61*	Elective -3 Chemistry of Biomolecules	5	3	25	75	100	5
7	17UCYE62*	Elective -4 Chemistry in the service of Mankind	5	3	25	75	100	5
8	17UCYE63*	Elective -5 Bio Inorganic Chemistry & Supramolecular Chemistry	-	-	-	-	100	0
	16UGKB61	General Knowledge						
* students to choose two among the three elective papers								

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Semester - V Core - 7 Hrs/wk - 5 credits 5

Title: INORGANIC CHEMISTRY – III

Sub. Code: 17 UCY C51

Objectives

To acquire the knowledge of chemistry of d & f-block elements among the groups and detailed study of metal complexes involving bonding, structure and isomerism. To learn the importance of metal ions in biological aspects.

Unit –I Transition elements (d - Block Elements) (15 hrs)

- (a) **The Transition Elements:** Definition- metallic character-ionic and atomic radii - oxidation states- reducing properties - formation of coloured compounds and complexes - magnetic properties- catalytic properties.
- (b) **First Transition Series:** Preparation, properties and uses of $TiCl_4$, V_2O_5 , chromyl chloride (CrO_2Cl_2), $KMnO_4$, $K_3[Fe(CN)_6]$, $Na_3[Co(NO_2)_6]$, blue vitriol and nickel tetracarbonyl – Alloys of Nickel.
- (c) **Second Transition Series:** Preparation, properties and uses of Mo_2O_5 , molybdenum blues, pertechnic acid and pertechnetates, RuO_4 , wilkinson's catalyst, cis-platin.
- (d) **Third Transition Series:** Preparation and uses of Tungsten bronzes, Chloroplatinic acid, Colloidal gold and purple of cassius, Fulminating gold - distinction between $AgCl$ & Hg_2Cl_2 .

Unit –II Inner-transition elements (f-block Elements) (15 hrs)

- (a) **The Lanthanide Series :** occurrence - electronic configuration – position in periodic table – oxidation states – magnetic properties – Lanthanide contraction – causes and its consequences – colour – complex formation – Extraction and uses of Lanthanides.
- (b) **The Actinide Series :** trans-uranic elements : definition, sources and preparation - position in periodic table - electronic configuration – oxidation states – ionic radii - actinide contraction – colour – formation of complexes – properties - comparison with lanthanides – Extraction and uses of thorium.

Unit –III Coordination Chemistry – I (15 hrs)

Double salts and coordination compounds – terminology: coordination sphere, coordination number, ligand and its types – Werner's coordination theory: postulates and experiment evidence - nomenclature **Isomerism:** structural isomerism and stereo isomerism - stability: thermodynamic and kinetic stability - factors affecting the stability of metal complexes – Experimental determination of composition of complexes by Job's method – **Chelates:** classification – chelate effect and application of the formation of chelated complexes in analytical chemistry.

Unit –IV Coordination Chemistry – II (15 hrs)

Sidgwick's concept: EAN rule –Valence Bond Theory: assumptions and illustration to 4- and 6- coordination ions - hybridization and geometry - limitations - Crystal Field Theory: salient features - orbital splitting as applied to octahedral, tetrahedral and square planar complexes - CFSE and its calculation - spectrochemical series- magnetic moments and color of transition metal complexes.

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Unit –V Biochemistry of Metals (15 hrs)

Essential and trace elements: Introduction and their classification - Metalloporphyrins: definition - hemoglobin and myoglobin - structure and function - cooperative and non-cooperative binding - Bohr effect - CO poisoning of Hb - chlorophyll- structure and its functions – metalloenzymes.

Role of Na^+ and K^+ ions in biological system - Na-K pump- role of calcium in biology - rickets - osteoporosis - hypercalcemia and hypocalcemia - comparison of biochemistry of Ca^{2+} and Mg^{2+} .

Text books:

1. Principles of Inorganic Chemistry by B.R.Puri, L.R. Sharma and K.C.Kalia – Milestone Publishers 31st Edn. (2012)
2. Modern Inorganic Chemistry by R. D. Madan and Satya Prakash -S.Chand and Co, 3rd Edn. (2014)

Reference books:

1. Inorganic Chemistry by J. E. Huheey et. al,- Pearson Education Pvt. Ltd., 4th Edn. (2004)
2. Bioinorganic Chemistry by K.Hussain Reddy, New age international, (2007)
3. Concise Coordination Chemistry by R.Gopalan et al - Vikas publishing house pvt Ltd
Revised edn.(2012)



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Semester - V Core - 8 Hrs/wk - 5 credits 5
Title: ORGANIC CHEMISTRY – II Sub. Code: 17 UCY C52

Objectives

To learn the general behavior of organic reactions with mechanism of aliphatic and aromatic carbonyl compounds, organo acids such as aliphatic, aromatic carboxylic acids, sulphonic acids and dicarboxylic acid. To get hold of the knowledge of stereochemistry of carbon compounds.

Unit –I ALIPHATIC CARBONYL COMPOUNDS (15 hrs)

- (a) **Preparation of aldehydes and ketones** involving nitriles, carboxylic acids, 1,3-dithianes, organometallics (magnesium, cadmium and lithium), hydrolysis, hydroboration-oxidation, oxidation & reduction methods – structure and reactivity of carbonyl group - acidity of α -hydrogens – relative reactivities of aldehydes and ketones. **Properties** : Nucleophilic addition reactions (HCN, sodium bisulphite, ammonia & its derivatives and GR) - condensation reactions (aldol, Cannizzaro, Mannich, Darzen, Reformatsky and haloform) with their mechanisms – reaction with phosphine derivatives (Wittig reaction) – oxidation reactions - reduction reactions (MPV, Clemmensen, Wolf-Kishner, catalytic and metal hydrides) and polymerisation reactions – distinguishing reactions between aldehydes and ketones.
- (b) Preparation, properties and uses of crotonaldehyde, glyoxal and acetylacetone.

Unit –II AROMATIC CARBONYL COMPOUNDS: (15 hrs)

- (a) **Preparation of aldehydes and ketones** involving carboxylic acids, Grignard reagent, nitrile (Stephen reaction) and electrophilic substitutions of aromatic hydrocarbons (Gattermann-Koch, Reimer-Tiemann, Vilsmeier, Sommelet and Friedel-Crafts reactions) oxidation and reduction reactions - reactivity of carbonyl group and its comparison with aliphatic aldehydes and ketones. **Properties:** Nucleophilic addition reactions – condensation reactions (Cannizzaro, Claisen-Schmidt, Perkin, Benzoin, Knoevenagel and Stobbe) with their mechanisms – electrophilic substitution reactions – oxidation and reduction reactions.
- (b) Preparation, properties and uses of cinnamaldehyde, vanillin, phloracetophenone and coumarin.

Unit –III ORGANO ACIDS - I (15 hrs)

- (a) **Aliphatic carboxylic acids** : **Preparation** methods involving oxidation, hydrolysis, carbonation, carbonylation, haloform reactions and Arndt-Eistert synthesis – acidic character – effect of substituents on acidic strength - **chemical properties** : reactions involving acidic hydrogen (reaction with bases, diazomethane), replacement of –OH groups (formation of acid halides, esters, amides, acid anhydrides and ketone), reactions involving –COOH group (formation of alcohol, alkane, haloalkane and carbonyl compounds) and reactions involving -carbon of carboxylic acids (HVZ reaction) – General study of acid derivatives viz., acid chlorides, amides, esters and acid anhydrides.

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- (b) **Aromatic carboxylic acids** : Preparation methods involving oxidation, hydrolysis, carboxylation and haloform reactions – acidic character – effect of substituents on acidic strength – **chemical properties** : reactions involving acidic hydrogen of –COOH, reactions involving –OH group (formation of acid chlorides, amides, esters and acid anhydrides) and reactions involving –COOH group (Hunsdiecker reaction etc.) - reduction and electrophilic substitution reactions.

Unit –IV ORGANO ACIDS - II (15 hrs)

- (a) **Substituted Carboxylic acids** : Preparation, properties and uses of chloroacetic acid, lactic acid and pyruvic acid – distinction between among various halo acids, hydroxy acids and keto acids - Preparation, properties and uses of salicylic acid.
- (b) **Dicarboxylic acids** : General methods of preparation and properties of aliphatic saturated dicarboxylic acids (upto glutaric acid) – Preparation and properties of maleic acid and fumaric acid – Preparation of citric acid and its importance – Preparation and properties of phthalic acid.
- (c) **Aromatic Sulphonic acids** : Preparation and properties of benzene sulphonic acid – comparison of acidity with carboxylic acid – electrophilic and nucleophilic substitution reactions – Preparation and properties of benzene sulphonyl chloride and sulphanilic acid – preparation and uses of saccharin and chloramine-T.

Unit –V STEREOCHEMISTRY (15 hrs)

- (a) **Optical isomerism** : concept of chirality – chirality in organic molecules : enantiomers and diastereoisomers - optical activity – definition and its determination – dissymmetry - absolute configuration : R and S notation – racemisation : racemic forms and enantiomeric excess – resolution : methods – asymmetric synthesis – Walden inversion – a brief study about the stereochemistry of allenes, spirans and biphenyl systems.
- (b) **Geometrical isomerism** : condition for existence – cis & trans system and syn & anti system – determination of configuration present in maleic acid and fumaric acid, aldoximes and ketoximes – E and Z nomenclature.

Text books:

1. Modern Organic Chemistry by M. K. Jain and S. C. Sharama -Vishal Publishing Co. 4th Edn. (2014)
2. Organic Chemistry by Bhupinder Mehta and Manju Mehta –Eastern Economy Edition,(2010)

Reference books:

1. Organic Chemistry by I.L.Finar (Vol. I & Vol.II) - Pearson Education Ltd. (2012)
 2. Stereochemistry of Organic Compounds by Eliel etal – Wiley India , reprint (2008)
 3. Text Book of Organic Chemistry by P.L.Soni and H. M Chawla - Sultan Chand & sons 29th Edn. (2012)
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Semester - V Core - 9 Hrs/wk - 6 credits 5
Title: Physical Chemistry-II Sub. Code: 17 UCY C53

Objectives

To acquire the knowledge of analyzing various aspects of solid systems through phase rule and distribution law. To have a thorough knowledge of energetic and kinetics of reactions by detailed study of laws of thermodynamics and chemical kinetics.

Unit –I PHASE RULE & DISTRIBUTION LAW (18 hrs)

- (a) **Phase rule:** Definition of the terms phase, component and degrees of freedom – conditions for equilibria between phases – derivation of Gibb's phase rule – eutectic point, congruent melting point and incongruent melting point .

One component system: H₂O, Sulphur and CO₂ systems – reduced phase rule - two component system: Lead – Silver, Potassium iodide –Water, Zinc – Magnesium and Sodium sulphate - Water systems.

- (b) **Distribution law:** statement – thermodynamic derivation – conditions – limitations – solvent extraction – applications.

Unit –II THERMODYNAMICS – I (18 hrs)

- (a) Introduction – energy and its units – work and heat – thermodynamic systems– properties of systems – state function and path function – thermodynamic processes – internal energy.
- (b) **First Law :** statement – mathematical formulation – enthalpy – heat capacity at constant pressure and at constant volume – C_p, C_v relationship – work done in isothermal reversible expansion and compression of an ideal gas- calculation of ΔE, ΔH, q and w for isothermal and adiabatic expansion of an ideal gas – reversible adiabatic expansion (P, V and T relationships) – Joule – Thomson effect for an ideal gas – comparison between isothermal and adiabatic expansions - Joule-Thomson co-efficient in ideal and real gases – inversion temperature and significance.
- (c) **Thermochemistry:** variation of enthalpies with temperature – Kirchoff's equation – Hess's law of heat summation - statement and applications – zeroth law of thermodynamics - significance.

Unit –III THERMODYNAMICS - II (18 hrs)

- (a) **Second Law of Thermodynamics :** Different ways of stating II law of thermodynamics – conversion of heat into work – Carnot's cycle – Carnot's theorem – thermodynamic efficiency - entropy – definition – derivation of the concept of entropy – entropy changes in reversible and irreversible processes – entropy change for an ideal gas - physical significance of entropy.
- (b) Free energy function – Gibb's free energy – Helmholtz free energy – variation of free energy change with temperature and pressure – Gibb's -Helmholtz equation and its applications – Clapeyron-Clausius equation and its applications – Maxwell's relationships.
- (c) **Chemical Potential :** Definition – significance – Gibb's-Duhem equation – variation of chemical potential with temperature and pressure.

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Unit –IV THERMODYNAMICS – III (18 hrs)

- (a) Application of thermodynamics to various types of equilibria – law of mass action – relation between K_p and K_c – equilibrium constant and free energy changes – Van't Hoff reaction isotherm – Van't Hoff reaction isochore.
- (b) Nernst heat theorem and its applications – Third law of thermodynamics – statement-determination of absolute entropy – residual entropy.
- (c) Colligative properties – Raoult's law - vapour pressure lowering, osmotic pressure(definition only) – depression of freezing point – elevation of boiling point - thermodynamic derivation.

Unit –V CHEMICAL KINETICS (18 hrs)

- (a) Introduction – rate of reaction – rate law and rate constant – order and molecularity – first order reactions – examples – rate equation – derivation - half life period - second order reactions - examples – rate equations – derivation - half life period - zero order and third order reactions - examples – rate equations (no derivation required) - determination of order of a reaction.
- (b) Influence of temperature on the rate of reaction – Arrhenius rate equation and its significance – theory of reaction rates – Bimolecular collision theory – Unimolecular reactions – Lindemann's hypothesis – Absolute Reaction Rate Theory - kinetics of fast reactions – flow methods for fast reactions – stopped flow method.

Text books:

1. Principles of Physical Chemistry by B.R.Puri, L.R.Sharma and S.Pathania - Vishal Publishing Co. (2011)
2. Essentials of Physical Chemistry by B.S.Bahl, Arun Bahl and G.T.Tuli - S.Chand and Co.Ltd., (2012)

Reference books:

1. A Textbook of Physical Chemistry by S.Glasstone - Macmillan (India) Ltd. (1976)
2. Advanced Physical Chemistry by D.A.Bajpai- S.Chand and Co.Ltd., 3rd Edn. 39th edition(2014).
3. Chemical Kinetics by K. J. Laidler, Pearson Edition (2008).

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Semester - V Core – 10 P Hrs/wk - 6 credits 5
Title: PHYSICAL CHEMISTRY EXPERIMENTS Sub. Code: 17 UCY MP3

Objectives:

To practice the kinetics, phase rule, electro analytical methods involved in the chemical reactions.

PHYSICAL CHEMISTRY EXPERIMENTS

1. Determination of molecular weight by a) Rast’s macro method b) Transition temperature method.
2. Phase Diagram involving a) simple eutectic. b) compound formation.
3. Heat of solution by solubility method.
4. Determination of strength of the given KI by Equilibrium constant method.
5. Conductometric titration- a) Acid vs Base b) Precipitation reaction .
6. Potentiometric Redox titrations: a) FeSO₄ vs KMnO₄. b) FeSO₄ vs K₂Cr₂O₇.
7. Colorimetric estimations of a) Nickel b) Iron c) Chromium
8. Preparation of various Buffer mixtures and comparing their pH values with theoretical values using pH meter.
9. pH titrations – a) Strong Acid vs Strong Base b) Weak Acid vs Strong Base.
10. Determination of relative strength of acid catalysed hydrolysis of ester.
11. Determination of Inversion of Sucrose by Polarimetry
12. Determination of CST on Phenol-water system and effect on impurity on CST- strength of NaCl.

Distribution of Marks Internal – 40 Marks External – 60 Marks

External Examination

Viva voce	- 10 marks
Record Notebook	- 05 marks
For completion of the experiment	- 20 marks
Graph	- 5 marks
Tabulation & Calculation	- 10 marks
Result	- 10 marks

 Total 60 marks

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310

Semester - V Core – 11 P Hrs/wk - 3 credits 2

Title: ORGANIC ESTIMATION AND ORGANIC PREPARATION Sub. Code: 17 UCY MP4

Objectives

To practice the preparative methods and quantitative estimation of organic substances.

ORGANIC ESTIMATION AND ORGANIC PREPARATION

I. ORGANIC ESTIMATION

1. Estimation of phenol.
2. Estimation of aniline.
3. Estimation of glycine.

II. ORGANIC PREPARATION

1. Preparation of p-bromo acetanilide from acetanilide (bromination)
2. Preparation of benzoic acid from benzamide.(hydrolysis)
3. Preparation of m-dinitrobenzene from nitrobenzene.(nitration)
4. Preparation of benzoic acid from benzaldehyde.(oxidation)
5. Preparation of benzoic acid from ethylbenzoate.(hydrolysis)

Distribution of Marks Internal – 40 Marks External – 60 Marks

External Examination

Record Note book - 05 marks

Viva voce - 10 marks

Organic Preparation - 15 marks

Procedure - 05 marks

Crude sample - 08 marks

Recrystallisation - 02 marks

Organic Estimation – 30 marks

Procedure - 05 marks Estimation - 25 marks

< 2% Error - 25 marks

2-3% Error - 20 marks

3-4% Error - 15 marks

4-5% Error - 10 marks

> 5% Error - 08 marks

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311

Semester - V Elective - 1 Hrs/wk - 5 credits 5

Title: ANALYTICAL CHEMISTRY AND GREEN CHEMISTRY Sub.Code: 17UCY E51

Objectives

To learn the data analysis, separation and purification methods, quantitative estimation of complexes by photometric methods, principles of gravimetric estimation. To know the adulterants present in the consumer products. To acquire the knowledge of green chemistry and greener methods for the synthesis of well known compounds.

Unit –I Data analysis & Chromatography (15hrs)

(a) Data Analysis : (i) Analysis of experimental results: Graphical method – curve fitting – method of least t squares - problems involving straight line graphs .

(ii) Error analysis : significant figures - Errors & its classification – methods used for minimisation of errors -precision & accuracy –confidence limits: Q –test, F- test & t - test.

(b) Chromatography : Definition – principle - R_f value - classification – detailed study of column, paper, thin layer, gas and ion exchange chromatographic techniques – an elementary idea about HPLC.

Unit –II Colorimetry & Polarimetry (15 hrs)

(a) Colorimetry : Principle – techniques for colour comparison – visual colorimetric methods: Duboscq colorimeter, Photoelectric colorimeter and Spectrophotometer – criteria for satisfactory colorimetric estimation – Estimation of Iron, Nickel and Chromium.

(b) Polarimetry : Theory – instrumentation – Optical Rotatory Dispersion – Plain curves and Cotton Effect curves – applications of optical rotation method in the determination of rate constant viz., acid-catalysed mutarotation of glucose and inversion of cane sugar.

Unit III Gravimetry & Radiometry (15 hrs)

(a) Gravimetry: Principle - methods of obtaining precipitate – precipitants and its types – sequestering agents – solubility product and precipitation – theories of precipitation – Co-precipitation and Post-precipitation – digestion and its effect – general rules of precipitation - precipitation from homogeneous medium – washing and drying of precipitate.

(b) Radiometry : Radioactive tracers – tracer technique – applications of tracer technique: reaction mechanism and structure investigation – radio carbon dating – problems – activation analysis – radiometric analysis - isotopic dilution analysis.

Unit –IV Analytical Chemistry in Consumer Protection (15 hrs)

(a) Detection of adulteration in some common food items: milk, meat, oils, ghee, coffer powder, asafoetida, chilli powder, turmeric powder, pulses.

(b) Food additives: sweeteners, preservatives, flavours, colourants – pesticide residues in food – natural food poisons – hair dye – problems of adulteration detection.

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Unit – V Green Chemistry

(15 hrs)

(a) Introduction- the need for green chemistry – goals of green chemistry – limitations of obstacles – twelve principles of green chemistry – concept of atom economy with illustrations – Green solvents : supercritical CO₂, H₂O and ionic liquids – solvent free synthesis. Mode of energy supply to a reaction: Microwave and Ultra sound.

(b) Applications: synthesis of adipic acid, methyl methacrylate, Urethane, vanillin, drugs like paracetamol, ibuprofen and polycarbonate polymers.

Text books:

1. Elements of Analytical Chemistry by R.Gopalan,P.S.Subramanian & K.Rengarajan – Sultan Chand & sons- reprint of 3rd Edn.(2011)
2. Modern Organic Chemistry by M. K. Jain and S. C. Sharama -Vishal Publishing Co. 4th Edn. (2014)

Reference books:

1. Analytical Chemistry by Gurdeep R.Chatwal – Himalaya Publishing House,1st Edn.(2008)
2. Analytical Chemistry by Gary D. Christian - Wiley; 6th Edn. (2003).
3. Green Chemistry by J.N.Gurtu & Amit gurtu – Pragati Prakasan – 2nd Edn. (2014)

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313

Semester - V Elective - 2 Hrs/wk - 5 credits 5

Title: CHEMISTRY OF MATERIALS

Sub code : 17 UCY E52

Objective:

To learn the structure, preparative methods with characterisation, properties viz., electrical, optical and magnetic of solids. To have a bird's eyes views on special materials.

Unit - I Structures of solids (15hrs)

Introduction to solids – crystalline and amorphous. Unit cell, Bravais lattices and X-ray structure determination (NaCl and KCl only) – powder and single crystal- methods and applications-identification of the cubic lattice and indexing of the X-ray diffraction lines. 1.2 Radius ratio rules – coordination number. Packing arrangement -different structure types in solids – rock salt, zinc blende, wurtzite, fluorite and antiferroite, spinel and inverse-spinel and perovskite structures.

UNIT-II Preparative methods and characterization (15hrs)

Solid state reactions – ceramic method, sol-gel, hydrothermal, high pressure, zone refining, CVD, Czochralski and Bridgman and Stockbarger methods. Physical methods – thermogravimetric and differential thermal analysis and scanning electron microscopy (only introduction and application).

UNIT-III Electrical and optical properties (15hrs)

Defects in solid state – point defects – Frenkel and Schottky defects and non-stoichiometric defects. Conductors – variation of conductivity with temperature – semicon cell – solar energy conversion, organic semiconductors. Piezoelectric, pyro-electric and ferroelectrics (introduction and application). Photoluminescence.

UNIT-IV Magnetic properties (15hrs)

Magnetic properties – classification - diamagnetic, paramagnetic, antiferromagnetic, ferro and ferri magnetic — magnetic susceptibility. Variation with temperature – Curie-Wiess law, Curie temperature and Neel temperature. Permanent and temporary magnets.

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UNIT-V Special materials

(15hrs)

Superconductivity – introduction, Meissner effect – mention of Bardeen, Cooper and Schrieffer theory and Cooper pairs – examples of superconducting oxides, Chevrel phases – applications of superconducting materials. Ionic conductors – sodium- β alumina, sodium-sulphur battery. Intercalation – layered compounds – graphitic compounds. Special applications of solid state materials. High energy battery, lithium cells.

Text books:

1. Solid State Chemistry by M. G. Arora, Anmol Publications, New Delhi, 2001.
2. Materials Science by P. K. Palanisamy, Scitech Publications, Chennai, 2003.

Reference books:

1. Solid State Chemistry and its applications by A. R. West, John-Wiley and sons, 1987.
2. Fundamentals of crystal chemistry by T R N Kutty and J A K Tareen, Universities press Limited, 2001.
3. Solid State Chemistry-An Introduction by Lesley Smart and Elaine Moore, Chapman Hall, London, 1992

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315

Semester - VI Core - 12 Hrs/wk - 5 credits 5
Title: Physical Chemistry III Sub. Code: 17 UCY C61

Objectives

To learn the preliminary idea about group theory and quantum mechanics. To get exposed of the principles and applications of electrochemistry and theoretical aspects of molecular spectroscopy.

UNIT –I QUNATUM MECHANICS & GROUP THEORY (15hrs)

(a) **Quantum mechanics:** Limitations of classical mechanics – Schrodinger wave equation – derivation – Eigen values and Eigen functions – significance of wave function and probability – particle in a one dimensional box and its derivation.

(b) **Group Thoery:** symmetry elements and its types - symmetry operations and the products of symmetry operations – Groups - properties and its types — group multiplication table – C_{2V} and C_{3V} - classes and sub groups. Point groups: explanation and classification - study of the following with examples: C_{2V} , C_{3V} , D_{2h} , and D_{6h} .

UNIT – II ELECTROCHEMISTRY – I (15 hrs)

Electrolytic conductance-Faraday's laws of electrolysis – specific conductance – equivalent conductance – molar conductance – variation of equivalent conductance with dilution – Electrolytes and its types – Arrhenius theory of ionization - postulates – limitations – degree of dissociation – factor influencing degree of dissociation – Ostwald's dilution law – theory of strong electrolytes – Debye-Huckel-Onsagar theory -Transport number – determination transport number : Hittorf's method – Kohlrausch's law of ionic mobilities and its applications –conductometric titrations: neutralization and precipitation.

UNIT – III ELECTROCHEMISTRY – II (15 hrs)

Comparison of electrolytic cells and electro chemical cells - Galvanic Cells – sign conventions, representation of a cell – single electrode potential – thermodynamics of reversible electrodes and cells – standard electrode potentials: electrochemical series – standard cell- reference electrode – the Nernst equation – concentration cells: electrode and electrolyte concentration cells – types of concentration cells: concentration cells without and with transference – liquid junction potential – applications of emf measurements : determination of pH using hydrogen electrode, quinhydrone electrode, glass electrode – potentiometric titrations : acid – base, redox and precipitation.

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UNIT – IV PHOTOCHEMISTRY

(15 hrs)

Introduction – comparison of thermal reactions and photochemical reactions – laws of photochemistry : Grotthus–Draper’s law, Einstein law of photochemical equivalence – quantum efficiency – experimental determination of quantum efficiency – kinetics of photochemical reactions: formation of HCl, HBr and decomposition of HI – photochemical equilibrium – photosensitization - Jablonski diagram - photophysical processes: fluorescence - phosphorescence - chemiluminescence – bioluminescence.

UNIT – V MOLECULAR SPECTROSCOPY

(15 hrs)

(a) Rotational spectra of diatomic molecules: rigid rotator – selection rule – determination of moment

of inertia and bond length – intensities of spectral lines – effect of isotopic substitution.

(b) Vibrational spectra : Hooke’s law – simple harmonic oscillator - force constant – selection rule Vibrational rotational spectra: P,Q,R bands- applications of IR spectra.

(c) Electronic spectra : Frank - Condon principle.

(d) Raman spectra: Raman effect – stokes and anti stokes lines, quantum theory of Raman effect – comparison between IR and Raman spectra – applications of Raman spectra.

Text books:

1. Principles of Physical Chemistry by B.R.Puri, L.R.Sharma and S.Pathania - Vishal Publishing Co. 43rd edn. (2008).
2. Essentials of Physical Chemistry by B.S.Bahl, Arun Bahl and G.T.Tuli - S.Chand and Co.Ltd., reprint Edn.(2014).

Reference books:

1. A Textbook of Physical Chemistry by S.Glasstone - Macmillan (India) Ltd. 2nd Edn.(1976).
 2. Advanced Physical Chemistry by Gurdeep Raj - Krishna Prakashan Media (P) Ltd 39th Edn. (2014).
 3. Advanced Physical Chemistry by D.N. Bajpai- S.Chand and Co.Ltd.,3rd Edn.(1992).
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317

Semester - VI Core - 13 Hrs/wk - 5 credits 5

Title: ORGANIC CHEMISTRY – III

Sub. Code: 17 UCY C62

Objectives

To learn the chemistry of nitro and amino compounds, polynuclear hydrocarbons, cycloalkanes and heterocyclic compounds. To get hold of the brief knowledge of molecular rearrangements.

Unit –I NITROGEN CONTAINING COMPOUNDS (15 hrs)

- (a) **Aliphatic nature :** (i) Preparation and properties of nitroethane and ethyl nitrite, ethylcyanide and ethyl isocyanide – elementary study of methyl isocyanate and its toxicity. (ii) Amines : Preparation of 1, 2, 3 amines by reductive amination, Hofmann degradation, Curtius, Leuckart, Gabriel Phthalimide and Hofmann elimination methods – basicity of amines – general chemical properties.
- (b) **Aromatic nature :** (i) Nitrobenzene : General methods of preparation - properties viz., reduction, electrophilic and Nucleophilic substitution reactions - acidic character of polynitro compound (ii) General methods of preparation of primary, secondary and tertiary amine - properties of primary amine – basic character of amines with the influence of substituents on N atom and in the ring. (iii) Benzenediazonium chloride : Preparation and synthetic applications.

Unit –II POLYNUCLEAR HYDROCARBONS (15 hrs)

- (a) **Isolated systems :** Preparation and properties of biphenyl, diphenylmethane and triphenylmethane including the study of dyes viz., Malachite green, Pararosaniline, Rosaniline and crystal violet.
- (b) **Fused systems :** Isolation, synthesis, properties and structure of naphthalene and anthracene – preparation and properties of derivatives of naphthalene derivatives viz., naphthols, naphthylamines and naphthaquinones including the study of the dyes (Naphthol yellow S, Naphthol green Y, Maritius Yellow, Orange II, congo red and alizarin – **Phenanthrene** : properties and its importance.

Unit –III HETEROCYCLIC COMPOUNDS (15 hrs)

- (a) **Monocyclic systems:** Nomenclature. (i) Pyrrole, Furan and Thiophene: a comparative study of their preparation and general properties viz., electrophilic substitution, addition, acidic and basic characters, oxidation, reduction and their interconversion. (ii) Pyridine: synthesis and its general properties viz., basic character, electrophilic substitution, nucleophilic substitution, reduction and oxidation reactions. (iii) Comparative study of preparation of pyrazole, thiazole and oxazole and the study of their basic character.
- (b) **Condensed systems:** Preparation, and general properties of indole, quinoline and isoquinoline – preparation of purine and pyrimidine – importance of heterocyclic compounds in medicine and biochemistry.

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Unit – IV ORGANOMETALLIC & ACTIVE METHYLENE COMPOUNDS (15 hrs)

- (a) **Organometallic compounds** : Preparation, properties and synthetic applications of Grignard reagent, Frankland reagent, Gilman reagent and organo lithium compounds.
- (b) **Active methylene compounds** : Preparation, properties and synthetic applications of malonic ester, acetoacetic ester and diazomethane.

Unit –V MOLECULAR REARRANGEMENTS & CYCLOALKANES (15 hrs)

- (a) **Molecular rearrangements** : Definition and its types – detailed study of the following mechanisms of the rearrangements – Pinacol-pinacolone, Hofmann, Claisen, Fries, Beckmann, Baeyer-Villiger, and Wagner-Meerwin.
- (b) **Cycloalkanes** : General methods of preparation – properties – stability : Bayer's strain theory and its modification. Conformation : Definition – conformational analysis of ethane, n-butane, cyclohexane and methyl cyclohexane.

Text books:

1. Modern Organic Chemistry by M. K. Jain and S. C. Sharma -Vishal Publishing co. 4th Edn. (2014).
2. A Text book of Organic chemistry by K.S. Tewari and N. K. Vishnoi - Vikas Publishing House pvt. Ltd. 3rd Edn. (2006).

Reference books:

1. Text Book of Organic Chemistry by P.L.Soni and H. M Chawla - Sultan Chand & sons 29th Edn. (2012).
2. Organic Chemistry by I.L.Finar (Vol. I & Vol.II) - Pearson Education Ltd. 6th Edn. (2012).
3. Advanced Organic Chemistry: Reactions, Mechanisms and Structure by Jerry March – Wiley India, 4th Edn.(2009)



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319

Semester - VI Core – 14 P Hrs/wk - 5 credits 4

Title: GRAVIMETRIC ESTIMATION AND INORGANIC COMPLEX PREPARATION

Sub. Code: 17 UCY MP5

Objective

To practice the preparative methods and estimation by gravimetric method of some inorganic compounds including complex

I. GRAVIMETRIC ESTIMATION

1. Estimation of Lead as lead chromate
2. Estimation of Barium as barium chromate
3. Estimation of Calcium as calcium oxalate monohydrate
4. Estimation of Nickel as Ni-DMG complex.
5. Estimation of Calcium as calcium carbonate.

II. INORGANIC COMPLEX PREPARATION

1. Preparation of ammonium hexachlorostannate(IV)
2. Preparation of Sodium nitroprusside.
3. Preparation of Tetraamminecopper(II) sulphate
4. Preparation of Potassium trioxalatochromate(III)
5. Preparation of Potassium trioxalatoaluminate (III).

Distribution of Marks Internal – 40 Marks External – 60 Marks

External Examination

Record Note book - 05 marks

Viva voce - 10 marks

Gravimetric Estimation – 30 marks

Procedure - 05 marks

Estimation - 25 marks

< 2% Error - 25 marks

2-3% Error - 20 marks

3-4% Error - 15 marks

4-5% Error - 10 marks

> 5% Error - 08marks

Inorganic Preparation - 15 marks

Procedure - 05 marks

Crude sample - 10 marks

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320

Semester - VI Core – 15 P Hrs/wk - 3 credits 2

Title: ORGANIC ANALYSIS Sub. Code: 17 UCY MP6

Objective

To analyze systematically the preliminary reactions to identify the functional group present in organic substances and confirmation by preparation of solid derivative.

Analysis of the given organic compound containing one or two functional groups and confirmation by the preparation of a solid derivative.

Functional groups to be analysed : acids, phenols, aldehydes, ketones, esters, nitro compounds, amines (primary, secondary and tertiary), amides, anilides, aliphatic diamide, side chain and nuclear halogen compounds, aliphatic diamide containing sulphur and monosaccharides.

Distribution of Marks	Internal – 40 Marks	External – 60 Marks
<u>External Examination</u>		
Record Notebook	- 10 marks	
Preliminary reactions	- 15 marks	
Elements present	- 9 marks	
Aliphatic or aromatic	- 3 marks	
Saturated / Unsaturated	- 3 marks	
Functional group	- 15 marks	
Derivative	- 5 marks	

	60 marks	

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321

Semester - VI Elective - 3 Hrs/wk - 5 credits 5

Title: Chemistry of Biomolecules Sub. Code: 17 UCY E61

Objective

To gain the knowledge of Biomolecules viz., carbohydrates, alkaloids, terpenes, steroids, hormones, nucleic acids, amino acids, proteins, vitamins and enzymes.

Unit –I CARBOHYDRATES (15 hrs)

- (a) Biological importance – Classification – analytical tests.
- (b) **Monosaccharides:** Glucose and Fructose – preparation, properties, structure (open chain, configuration and ring structure) – ascending and descending of aldose, mutarotation, epimerization and interconversion.
- (c) **Disaccharides:** Sucrose – manufacture, properties, structure and uses – a brief study about lactose. **Polysaccharides:** A general study of starch and cellulose – Industrial applications of cellulose derivatives.

Unit – II ALKALOIDS AND VITAMINS (15 hrs)

- (a) **Alkaloids :** Introduction - biological importance - occurrence – extraction - general methods of determining the structure - general properties - Isolation, properties, uses, constitution and synthesis of coniine, nicotine and quinine.
- (b) **Vitamins :** Introduction - classification - source, structure (only), biological role, daily requirement and deficiency manifestation of vitamins A, D, E, K, C and B complex (B₁, B₂, B₃, B_C, B₆, B₁₂ and niacin)

Unit – III TERPENES AND LIPIDS (15 hrs)

- (a) **Terpenes :** Introduction - biological importance – isoprene rule – classification - isolation and extraction of terpenes - general methods of determining the structure -Isolation, structure, synthesis and uses of citral, α -terpineol and camphor. **Polyterpene:** an elementary study of natural rubber
- (b) **Lipids :** Introduction - biological functions – classification. Simple lipids : Fats and oils – composition – isolation - general properties – hydrolysis, hydrogenation, hydrogenolysis and trans-esterification – Flavour changes in oils and fats – analytical characterization of fats and oils – Acid value, RM value, saponification value and iodine number. A brief study about compound lipids.

Unit - IV AMINO ACIDS, PROTEINS AND ENZYMES (15 hrs)

- (a) **Amino acids :** Introduction - Essential and non-essential amino acids -classification - synthesis by Gabriel, Strecker and Erlenmeyer methods – isoelectric point - zwitter ion - general chemical properties. Peptides : introduction - synthesis by carbobenzoxy method and Sheehan method.



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Semester - VI Elective - 4 Hrs/wk - 5 credits 5

Title: Chemistry in the service of Mankind Sub code : 17 UCY E62

Objective

To acquire the knowledge of drugs, batteries, polymers, nanomaterials and clinical testing body fluids in day today life.

Unit I Pharmaceutical Chemistry (15 hrs)

Pharmacology : Definition and its important terminologies – drug - meaning and its sources - outline of its classification – routes of drug administration - Dosage of drug – different dosages forms of drugs - mechanism of drug action – metabolism of drugs - study of SAR .

Explanation of the following drugs with examples: antibiotics, antiseptics, anaesthetics, antipyretic analgesics, anti-inflammatory agents , sedatives and hypnotics, anticonvulsants, muscle relaxants, diuretics, expectorants and antitussives, cardio vascular drugs, steroids and antineoplastic agents.

Unit II Clinical Chemistry (15 hrs)

Blood : composition – coagulation of blood – blood grouping – anticoagulants- Anaemia : diagnosis and testing – antianaemic drugs.

Diagnostic testing and estimation of haemoglobin, glucose, cholesterol, bilirubin, plasma proteins, erythrocyte counts creatinine and uric acid present in blood – urine analysis.

Unit III Polymer Chemistry (15 hrs)

Polymers: definition – degree of polymerisation – classification – molecular weight: number average and weight average concept – determination of molecular weight : viscosity method, osmotic pressure, sedimentation method and light scattering method .

Preparation and applications of polymers : polyethylene. PVC, polyester and polymethyl methacrylate. Composite: definition – constituents –types – polymer matrix composites.

Unit IV Commercial Electrochemical Cells & Corrosio (15 hrs)

Batteries : definition – types – Dry cell - alkaline manganese cell - lead-acid, nickel-cadmium and lithium batteries. Corrosion : definition – causes and consequences - types – factors responsible for corrosion - corrosion control and its prevention methods viz., electroplating, cathodic protection, sacrificial protection – brief outline of passivity.

Unit V Nanomaterials (15 hrs)

Nanomaterials: Introduction - characterization – synthetic routes – preparation, properties and applications of CNT, gold and silver nanomaterial - Applications of Nanomaterial in the fields of electronics (quantum dots, sensors, optoelectronic devices), catalysts, medicine, consumer products, textiles, paints, defence and space applications.

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Text Books :

1. Text book of Pharmaceutical Chemistry and Medicinal Chemistry by Ragupathi etal – Books and allied Pvt.Ltd., 1st Edn.(2011)
2. A Textbook of Physical Chemistry by S.Glasstone - Macmillan (India) Ltd. 1976.

Reference books:

1. Pharmaceutical chemistry by S. Lakshmi – Sultan chand &sons 3rd Edn. (2004)
2. Polymer Science by V. R. Gowariker, N. V. Viswanathan, J. Sreedhar, Wiley: New York, 1986
3. Nano: The Essentials of Understanding Nanoscience and Nanotechnology by T .Pradeep- Tata Mc Graw Hill Publishing Company Ltd.,1st Edn.2007



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Semester - VI Elective - 5 Hrs/wk - 5 credits 5

Title: BIO-INORGANIC CHEMISTRY AND SUPRAMOLECULAR CHEMISTRY

Sub. Code: 17 UCY E63

Objective:

To get accumulated the knowledge of metals with biomolecules, binding aspects with respect to chelation and basic chemical reactions. To have an idea of metal chelates in medicine. To acquire the structural aspects of host – guest chemistry.

Unit –I Bioelements, Biomolecules and background materials (15hrs)

Essential and trace elements- their biological importance – Biomolecules : a brief idea about sugars, amino acid, organic acids, peptides , protein, enzymes, purine & pyrimidine bases, nucleosides, nucleotides, nucleic acid, lipids and phospholipids – bioligands in biocoordination chemistry – biological function of biometals – chemistry of physiological buffer.

Unit –II Metal-Protein interaction (15 hrs)

Metalloproteins and metal-protein complexes – metalloenzymes and metal – activated enzymes – role of metal ions in Metal – Protein systems : structural context, template synthesis of macrocyclic bioligands – blocking of functional group – Lewis acid catalyst in metalloenzyme -biological redox reactions – electron transport process – binding of transition metal complexes with DNA as nucleic acid structural probe.

Unit III Lewis Acidity of Metal Ions (15 hrs)

Metal –containing enzymes in hydrolysis, decarboxylation and group transfer reactions : structure and reactivity of carboxypeptidase A, Thermolysin, Adenosine Deaminase and Cytidine Deaminase, Urease, Insulin, Carboxylase and Decarboxylase

Unit –IV Metal and Chelation in Medicine (15 hrs)

Metal ion toxicity for the following metals : Fe, Cu, As, Hg, Pb, Cd, Al, Ca and Ru – antimicrobial activities of metal chelates and chelating ligands such as ionophore antibiotics, tetracyclines, oxines, As-, Sb- and Hg- compounds –metal chelation and activity of Aspirin –mercurias as Diuretics – anti-inflammatory effects of Zn and Cu compounds – Lithium therapy in psychiatric mind disorder – anti cancer activity of platinum complexes.

Unit – V Supramolecular Chemistry (15 hrs)

Introduction – Host – guest chemistry. Theory and Examples - **Organic host molecules** : Cyclodextrins - properties - structure – applications in organic selective and specific reactions - Fullerenes - types - structure - applications. **Inorganic host molecules**: Clay - types and applications. Zeolite - types – modifications of zeolites – applications.

Passed in the BOS Meeting
held on 15-3-2017

Signature of Chairman/HOD



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Text Books :

1. Bioinorganic Chemistry by Asim K. Das, Books and Allied (p) Ltd. First edn. reprint (2016)
2. Supramolecular Chemistry by J.W.Steed and J.K.Atwood , Wiley Sons Ltd.,Second Edn. (2009).

Reference books:

1. A Text Book on Medicinal Aspects of Bio-inorganic Chemistry by Asim K. Das, CBS Publishers & Distributors, First edn, (1990).
2. Principles of bioinorganic chemistry by Stephen J. Lippard, University Science Books, First edn.(1994)
3. Bioorganic, Bioinorganic and Supramolecular chemistry by P S Kalsi and J P Kalsi, New Age International Publishers, 3rd edn (2017)



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Semester - VI Core - 16 Hrs/wk - 2 credits 2

Title: Objective Chemistry (viva-voce) Sub. Code: 17 UCY CV1

Objective

To refresh all the aspects of chemistry studied during three years of course to enable students to face competitive examinations and interviews.

Unit –I Physical Chemistry (6 hrs)

Basic laws pertained gaseous states – crystals - Energetics and dynamics of chemical reactions – photo chemical reactions – electrochemical cells –knowledge of liquid crystals – radioactivity – colloidal states.

Unit II Organic Chemistry (6 hrs)

Common names and IUPAC names of organic compounds – electronic effects – stereochemistry - petroleum and its products – use of reagents such as organometallics, active methylene compounds in the synthesis of various compounds – utility of natural products such as steroids, alkaloids, vitamins etc.- common name reaction

Unit III Inorganic Chemistry (6 hrs)

Atomic structure and chemical bonding – acids and bases –types of reactions – periodic table and properties – minerals and common inorganic substances used in day to day life – uses of coordination compounds

Unit IV Analytical Chemistry (6 hrs)

Knowledge of preparation of solutions using various concepts -types of reactions involved in the analysis of raw materials used in industries - assay determination – knowledge of indicators – electronic instruments including spectrometers used in analysis and their utility.

Unit V Pharmaceutical Chemistry (6 hrs)

Important terms and their explanation - knowledge of drugs commonly used for various diseases - preliminary ideas about formulation of various drugs viz. tablets, syrups, injections, etc. Organic pharmaceutical aids: Preservatives, antioxidants, emulsifying agents, clouring, flavouring and sweetening agents, stabilizing agents, ointment bases, solvents.



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Reference Books :

1. A Text book of Organic chemistry by K.S. Tewari and N. K. Vishnoi - Vikas Publishing House pvt. Ltd. 3rd Edn. (2006).
2. Essentials of Physical Chemistry by B.S.Bahl, Arun Bahl and G.T.Tuli - S.Chand and Co.Ltd., (2012).
3. Principles of Inorganic Chemistry by Puri, Sharma & Kalia, Milestone publisher & distributor (2009).
4. Analytical Chemistry by Gurdeep R.Chatwal – Himalaya Publishing House, 1st Edn.(2008).
5. A Text book of Pharmaceutical Chemistry by Jayashree Ghosh, S.Chand & Co. Ltd, (2012).

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