CHANDIDAS MAHAVIDYALAYA

DEPARTMENT OF CHEMISTRY

A Govt. Aided Degree College Affiliated to the University of Burdwan.

*UGC Accredited under section 2(f) & 12(B) [1979] * NAAC Accredited in 2016*

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Ref.No: Date :

B.Sc CHEMISTRY (GENERAL)(CBCS)
Session: 2022-2023
Module

CORE COURSE IA: Inorganic and Organic Chemistry(Theory)		No. of Classes
Module 1	❖ Bohr's theory for hydrogen atom (simple mathematical treatment), atomic spectra of hydrogen and Bohr's model	2
Module 2	❖ Sommerfeld's model, quantum numbers and their significance, Pauli's exclusion principle, Hund's rule	3
Module 3	❖ Classification of elements on the basis of electronic configuration: general characteristics of s-,p-, d- and f-block elements	3
Module 4	❖ Atomic and ionic radii,ionization potential, electron affinity, and electronegativity	2
Module 5	❖ Brönsted–Lowry concept, conjugate acids and bases, relative strengths of acids and bases, effects of substituent and solvent	3
Module 6	❖ Lewis acid-base concept, classification of Lewis acids and bases, Lux-Flood concept and solvent system concept	3
Module 7	❖ Hard and soft acids and bases (HSAB concept), applications of HSAB process.	2
Module 8	❖ Balancing of equations by oxidation number and ion-electron method oxidimetry and reductimetry.	3
Module 9	❖ Fundamentals of Organic Chemistry	5
Module 10	❖ Stereochemistry: Different types of isomerism; geometrical and optical isomerism; concept of chirality and optical activity	5

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Module 11	❖ Nucleophilic Substitution and Elimination Reactions	5
Module 12	❖ Aliphatic Hydrocarbons : Functional group approach	3
Module 13	❖ Alkanes: Preparation: catalytic hydrogenation, Wurtz reaction, Kolbe's synthesis	5
Module 14	❖ Alkenes: Preparation: elimination reactions: dehydration of alcohols.	4
Module 15	❖ Alkynes: Preparation: acetylene from CaC2 and conversion into higher alkynes	5
Module 16	❖ Reactions: formation of metal acetylides, addition of bromine and alkaline KMnO4, ozonolysis and oxidation with hot alkaline KMnO4	5
CORE COURSE IA: Inorganic and Organic Chemistry (Practical)		
Module 1	❖ Titrimetric Estimation of Mohr Salt, Oxalic Acid, KMnO4	4
Module 2	❖ Estimation of Fe(II) and Cu(II) by Titration	4
Module 3	❖ Qualitative analysis of single organic solids.	5
CORE COURSE I B: Physical and Inorganic Chemistry (Theory)		
Module 1	❖ Kinetic Theory of Gases and Real gases(1): Concept of pressure and temperature; Collision of gas molecules	3
Module 2	❖ Kinetic Theory of Gases and Real gases(2): Nature of distribution of velocities, Maxwell's distribution of speed and kinetic energy	5
Module 3	❖ Deviation of gases from ideal behavior; compressibility factor; Boyle temperature; Andrew's and Amagat's plots	5
Module 4	❖ Liquids: Viscosity and Surface tension	4
Module 5	❖ Solids: Forms of solids, crystal systems, unit cells, Bravais lattice types, Symmetry elements; Laws of Crystallography	5
Module 6	❖ Chemical Kinetics: Rates of First, second and nth order reactions and their Differential and integrated forms	7
Module 7	❖ Chemical Bonding and Molecular Structure(1): Ionic Bonding: General characteristics of ionic bonding	5
Module 8	❖ Chemical Bonding and Molecular Structure(2): Covalent bonding: VB Approach	5
Module 9	❖ Chemical Bonding and Molecular Structure(3): Concept of resonance and resonating structures in various inorganic and organic compounds.	4
Module 10	❖ Chemical Bonding and Molecular Structure(4): MO Approach: Rules for the LCAO method, bonding and antibonding MOs	6
Module 11	❖ Comparative study of p-block elements: Group trends in electronic configuration, modification of pure elements, common oxidation states	8

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CORE COURSE I B: Physical and Inorganic Chemistry (Practical)		
Module 1	❖ Measurement of Surface tension and Viscosity	3
Module 2	❖ Kinetic study of various reactions	3
Module 3	❖ Qualitative semi-micro analysis of Acid radicals	3
Module 4	❖ Qualitative semi-micro analysis of Basic radicals and their mixtures	4
CORE COURSE IC: Physical and Organic Chemistry (Theory)		
Module 1	❖ Chemical Energetics (1): Concept of heat, work, internal energy and statement of first law; enthalpy H	5
Module 2	❖ Chemical Energetics (2): Standard states; Heats of reaction; enthalpy of formation of molecules and ions and enthalpy of combustion and its applications; Laws of thermochemistry	5
Module 3	❖ Chemical Energetics (3): Entropy change of systems and surroundings for various processes and transformations	5
Module 4	❖ *Chemical Equilibrium*: Thermodynamic conditions for equilibrium, degree of advancement; Variation of free energy with degree of advancement	5
Module 5	❖ *Ionic Equilibria:* Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization	6
Module 6	❖ *Aromatic Hydrocarbons:* up to 4 carbons on benzene	6
Module 7	❖ *Organometallic Compounds:* Introduction; Grignard reagents: Preparations	3
Module 8	❖ *Aryl Halides:* Preparation: (chloro-, bromo- and iodobenzene): from phenol, Sandmeyer reactions. Reactions	3
Module 9	❖ *Alcohols, Phenols and Ethers:* 1°-, 2°- and 3°- alcohols	6
Module 10	❖ *Carbonyl Compounds:* Aldehydes and Ketones (aliphatic and aromatic):	5
CORE COURSE IC: Physical and Organic Chemistry (Practical)		
Module 1	❖ Measurement of pH of different solutions	2
Module 2	❖ pH of an unknown buffer solution by colour matching method	2
Module 3	❖ Identification of pure organic solids	4
Module 4	❖ Identification of pure organic liquids	4

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CORE COURSE ID: Physical and Analytical Chemistry (Theory)		
Module 1	❖ *Solutions:* Ideal solutions and Raoult's law, deviations from Raoult's law – non-ideal solutions	3
Module 2	❖ Critical solution temperature; effect of impurity on partial miscibility of liquids; Immiscibility of liquids-Principle of steam distillation	3
Module 3	❖ *Phase Equilibria:* Phases, components and degrees of freedom of a system, criteria of phase equilibrium; Gibbs Phase Rule and its thermodynamic derivation	5
Module 4	❖ Phase diagrams of one-component systems	2
Module 5	❖ *Conductance:* cell constant, specific conductance and molar conductance; Variation of specific and equivalent conductance with dilution for strong and weak electrolytes	4
Module 6	❖ Equivalent and molar conductance at infinite dilution and their determination for strong and weak electrolytes; Ostwald's dilution law	3
Module 7	❖ *Electromotive force:* Faraday's laws of electrolysis, rules of oxidation/reduction of ions based on half-cell potentials, applications of electrolysis in metallurgy and industry	4
Module 8	❖ Concentration cells with and without transference, liquid junction potential; pH determination using hydrogen electrode and quinhydrone	3
Module 9	❖ *Chemical Analysis:* Gravimetric analysis: solubility product and common ion effect; requirements of gravimetry	4
Module 10	❖ . Volumetric analysis: primary and secondary standard substances; principles of acid-base, oxidation –reduction and complexometric titrations	3
Module 11	❖ *Environmental Chemistry:* The Atmosphere: composition and structure of the atmosphere; troposphere, stratosphere, mesosphere and thermosphere; ozone layer and its role	4
Module 12	❖ The Hydrosphere: environmental role of water, natural water sources, water treatment for industrial, domestic and laboratory uses	3

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CORE COURSE ID: Physical and Analytical Chemistry (Practical)		
Module 1	❖ Study of the equilibrium by the distribution method	3
Module 2	❖ Conductometric and Potentiometric measurements	4
Module 3	❖ Determination of hardness of water and PH of unknown solution	3
Module 4	❖ Determination of solubility and strength of unknown solution	3
DISCIPLINE SPECIFIC ELECTIVE COURSE 1A: Analytical and Industrial Chemistry (Theory)		
Module 1	❖ Transition Elements: General group trends with special reference to electronic configuration, variable valency, colour, magnetic and catalytic properties	3
Module 2	❖ Lanthanoids and actinoids: Electronic configurations, oxidation states, colour, magnetic properties, lanthanide contraction	3
Module 3	❖ Coordination Chemistry: Werner's coordination theory, Valence Bond Theory (VBT): Inner and outer orbital complexes of Cr, Fe, Co, Ni and Cu	3
Module 4	❖ Drawbacks of VBT; IUPAC system of nomenclature	2
Module 5	❖ Crystal Field Theory: Crystal field effect, octahedral symmetry. Crystal field stabilization energy (CFSE), Crystal field effects for weak and strong fields	3
Module 6	❖ Comparison of CFSE for Oh and Td complexes, Tetragonal distortion of octahedral geometry. Jahn-Teller distortion, Square planar coordination	3
Module 7	❖ Error analysis: accuracy and precision of quantitative analysis, determinate, indeterminate, systematic and random errors	3
Module 8	❖ Computer applications: general introduction to computers, different components of a computer; hardware and software; input and output devices	3
Module 9	❖ Fuels: classification of fuel; heating values; origin of coal, carbonization of coal, coal gas, producer gas, water gas, coal based chemicals; origin and composition of petroleum	4
Module 10	❖ Fertilizers, Glass and ceramics, Cement:	6
DISCIPLINE SPECIFIC ELECTIVE COURSE 1A: Analytical and Industrial Chemistry (Practical)		
Module 1	• *Gravimetric and Complexometric estimation of metals ions*:	4
Module 2	• Titrimetric estimations	4

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DISCIPLINE SPECIFIC ELECTIVE COURSE 1B: Organic Chemistry and Industrial Chemistry (Theory)		
Module 1	❖ Carboxylic acids (aliphatic and aromatic): strength of organic acids: comparative study with emphasis on factors affecting pK values; Preparation	4
Module 2	❖ Carboxylic acid derivatives (aliphatic): (up to 5 carbons). Preparation: acid chlorides, anhydrides, asters and amides	4
Module 3	❖ Amines (aliphatic and aromatic): strength of organic bases; Preparation: from alkyl halides, Gabriel's phthalimide synthesis, Hofmann degradation	3
Module 4	❖ Diazonium salts: Preparation: from aromatic amines; Reactions: conversion to benzene, phenol, benzoic acid and nitrobenzene	3
Module 5	❖ Amino Acids: Preparations (glycine and alanine only): Strecker synthesis, Gabriel's phthalimide synthesis	2
Module 6	❖ Carbohydrates: classification and general properties; glucose and fructose: constitution; osazone formation; oxidation-reduction reactions; epimers of glucose	3
Module 7	❖ Polymers: structure and types of plastics, polythene, polystyrene, phenolformaldehydes, PVC; manufacture, physical properties	3
Module 8	❖ Paints, Varnishes, Synthetic Dye	3
Module 9	❖ Drugs and pharmaceuticals, Fats and oils:	4
Module 10	❖ Soaps and detergents ,Pesticides ❖ Food additives	6
DISCIPLINE SPECIFIC ELECTIVE COURSE 1B: Organic Chemistry and Industrial Chemistry (Practical)		
Module 1	❖ Nitration and condensations reactions	3
Module 2	❖ Acylation and benzylation of aromatic amines	3
Module 3	❖ Hydrolysis and crystallyzation of compounds	2
Module 4	❖ Determination of Saponification value	1
SKILL ENHANCEMENT COURSE 3: Basics & Application of Computer in Chemistry (Theory)		
Module 1	❖ *Mathematics:* mathematical functions, polynomial expressions, logarithms	2
Module 2	❖ Uncertainty in measurement: Types of uncertainties. Statistical treatment: Mean, standard deviation, calculation of relative error	3

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Module 3	❖ Differential calculus: The tangent line and the derivative of a function, numerical differentiation	2
Module 4	❖ *Computer Programming:* Bits, bytes, binary and ASCII formats, arithmetic expressions ❖ BASIC programs for curve fitting, finding roots	4
SKILL ENHANCEMENT COURSE 4: Polymer Chemistry (Theory)		
Module 1	❖ Introduction and history of polymeric materials	2
Module 2	❖ Functionality and its importance	1
Module 3	❖ Kinetics of polymerization	2
Module 4	❖ Determination of molecular weights	3
Module 5	❖ Properties of polymers	2

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