



THE BHAWANIPUR EDUCATION SOCIETY COLLEGE

A MINORITY RUN COLLEGE AFFILIATED TO UNIVERSITY OF CALCUTTA
RECOGNISED UNDER SECTION 2(F) & 12(B) OF THE UGC ACT, 1956

Department: Chemistry

2018-19

Programme Specific Outcomes (PSO)

PSO 1: Be able to describe the fundamental scientific principles in the subfields of chemistry (analytical, inorganic, organic and physical), and apply these principles to problems. They are able to explain, integrate and apply relevant knowledge to problems that emerge from the broader interdisciplinary subfields (life, environmental and materials sciences).

PSO 2: With guidance, be able to apply the methodologies in order to conduct chemical syntheses, analyses or other chemical investigations. Obtain information from library, online and literature resources that will support the solving of chemical and research problems.

PSO 3: Be able to use chemical knowledge to predict and rationalize properties, mechanisms and patterns of reactivity. Be able to prepare logical, organized and concise written reports, and oral and poster presentations that effectively communicate chemical content to other scientists. Be able to field questions pertaining to chemical theory, research experimental design and data interpretation.

PSO 4: Recognize assumptions and limitations in the scientific models and simulations, and propose their possible impact on the results.

PSO 5: Evaluate the accuracy of, and the sources of errors in, experimental measurements. Be able to work productively and collaboratively as a team member.



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Programme Outcome (PO)

	Program Outcome	Description
PO1	Subject Knowledge	This course helps students to attain the basic understandings in the theoretical and practical feature of Chemistry
	Method of Measurement:	Internal Assessment
PO2	Critical thinking	Upon completion of the chemistry course, majors are able to recognize and apply the principles of atomic and molecular structure to predict chemical properties and chemical reactivity. Upon completion of a chemistry degree, chemistry majors are able to interpret and analyze quantitative data.
	Method of Measurement:	Continuous Internal Assessment
PO3	Effective communication	Communicating about chemistry has the potential to raise public interest and understanding of chemistry around the world. Chemistry communication presents a framework to use in the design, implementation and evaluation of their public communication efforts.
	Method of Measurement:	Regular Student-Teacher Interaction
PO4	Social Interaction	Be able to identify and describe the underlying principles behind chemical techniques relevant to academia, industry and government
	Method of Measurement:	Regular Presentation Seminars
PO5	Ethics	Students will appreciate the central role of chemistry in our society and use this as a basis for ethical behaviour in issues facing chemists including an understanding of safe handling of chemicals, environmental issues and key issues facing our



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		society in energy, health and medicine.
	Method of Measurement:	Regular Student-Teacher Interaction
PO6	Laboratory Skills and Instrumentation	Upon completion of a degree, chemistry majors are able to employ scientific thinking and inquiry in the performance, design, interpretation and documentation of laboratory experiments, at a level suitable to succeed at an entry-level position in chemical industry or a chemistry graduate program. They are able to understand theoretical concepts of instruments that are commonly used in most chemistry fields as well as interpret and use data generated in instrumental chemical analyses.
	Method of Measurement:	Continuous Practical Assignments
PO7	Environment and Sustainability	Chemistry is crucial to finding sustainable solutions to far-reaching challenges, including: Energy provision, Environmental protection, Food and water safety, Global healthcare and explore the resources to learn more about chemistry's role in sustainability.
	Method of Measurement:	Regular Student-Teacher Interaction
PO8	Self-directed and life-long learning	The role of chemistry acquires flexible knowledge and problem solving skills to facilitate the expected development of our modern society. This area helps B.Sc. chemistry graduates to communicate the concept and results of laboratory experiments through effective independent writing and oral communication skills.
	Method of Measurement:	Student-Teacher Interaction on Research Topics



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Course Outcome (CO)

Second Year	
Paper IIIA	
CHT 22a Unit I. Addition reactions Unit II. Elimination and aromatic substitution CHT 22b Unit I. Nitrogen compounds and Organometallics Unit II. Reactions: Rearrangements	CO3A.1: Stereochemical and regiochemical outcome of electrophilic addition and elimination (E1 and E2) reactions.
	CO3A.2: It gives a good overview of the fundamental principles of organometallic chemistry and comprehensive understanding of nitrogenous compounds.
	CO3A.3: Basic ideal of organic rearrangement reaction.
Paper IIIB	
CHT 23a Unit I. Thermodynamics and Equilibrium Unit II. Liquid State and Viscosity of Fluids CHT 23b Unit I. Quantum Chemistry I Unit II. Electrochemistry	CO3B.1: Advanced concept of chemical and thermodynamic equilibrium and Le Chatelier's principle.
	CO3B.2 Gives the idea of viscosity and surface tension of liquids and gases.
	CO3B.3: Preliminary idea of quantum mechanics
	CO3B.4: Gives the concept of construction and reaction of electrochemical cell and EMF.
Paper IVA	
CHT 21a Unit I. Chemical Periodicity II Unit II. Other Types of Bonding CHT 21b Unit I. Chemistry of s- and p-block Elements Unit II. Precipitation and Redox Reactions	CO4A.1: It gives the information about electronic configuration, magnetic properties, and catalytic properties of the elements.
	CO4A.2: MOT gives the idea about bond order, bond length, magnetic property, structure and reactivity of the molecules.
	CO4A.3: Redox reaction: It gives the idea about whether the reaction is oxidized or reduced and what factors influence on it.
Paper IVB	
CHP 24a Analytical Estimations CHP 24b Instrumental Estimations	CO4B.1: To develop the skill of basic manual of quantitative analyses of inorganic mixtures.
	CO4B.2: The instrument based experiments give the idea of



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	working principle of the different instruments and how to analysis the results.
Third Year	
Paper V	
CHT 31a Unit I. Chemistry of coordination compounds Unit II. Chemistry of d- and f-block elements	CO5.1: Idea of coordination and organometallic compounds and its color, magnetic property, spectra and reaction.
CHT 31b Unit I. Organometallic Compounds Unit II. Bioinorganic Chemistry	CO5.2: It gives the idea about the role of metals and non metals in biological systems and basic concepts of environmental chemistry.
CHT 31c Unit I. Electrochemical and spectral analysis, and analytical separation Unit 2. Statistical methods in chemical analysis and environmental analysis	CO5.3: It also deals with different analytical methods and thermodynamics.
CHT 31d Unit I: Gravimetric and tritometric methods of analysis Unit II. Thermodynamics of dissolution	
Paper (VIA + VIB)	
CHT 32a Unit I. Carbanion chemistry and cyclic stereochemistry Unit II. Spectroscopy UV, IR, NMR (elementary)	CO6.1: Generation of various types of carbanions and its reactivity.
CHT 32b Unit I. Synthetic strategies and Asymmetric synthesis Unit II. Carbohydrate chemistry	CO6.2: Fundamental idea of various spectroscopic techniques and synthetic strategies.
CHT 32c Unit I. Carbocycles and Heterocycles Unit II. Amino acids, peptides and nucleic acids	CO6.3: The fundamental properties and reactivity of biologically important compounds.
CHP 34a Spectroscopic Analysis of	CO6.4: To develop the skill of interpret NMR and IR spectra of various organic compounds.



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Organic Compounds	
Paper (VIIA + VIIB)	
CHT 33a Unit I. Properties of solids, interfaces and dielectrics Unit II. Quantum Chemistry – II CHT 33b Unit I. Phase equilibrium and colligative properties Unit II. Statistical thermodynamics and the third law CHT 33c Unit I. Kinetics and photochemistry Unit II. Spectroscopy CHP 35a Physical Experiments	CO7.1: It gives the clear idea of structure, properties of different types of crystal.
	CO7.2: Gives the idea of simple harmonic oscillator, Schrodinger equation, concepts the statistical thermodynamics.
	CO7.3: To learn about physical spectroscopy, kinetics, photochemistry, phase equilibrium and colligative properties.
	CO7.4: To perform the different non-instrumental experiments and their theoretical concepts within a stipulated time.
Paper (VIII A + VIII B)	
CHP 34b Experiment -1. Qualitative analysis of single solid organic compounds Experiment - 2. Organic preparations CHP 35b Physical Experiments	CO8.1: To develop the skill of basic manual qualitative analyses of organic functional groups.
	CO8.2: The basic idea of organic synthesis through the preparation methodology.
	CO8.3: To apply and perform the different instrumental experiments using their theoretical concepts and the working principle of the instruments.



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Subject: Chemistry (Honours) 2018-2019	
Paper	Course Outcome
Semester 1	
CEMA-CC-1-1	
INORGANIC CHEMISTRY-1 Acid-base and redox reactions ORGANIC CHEMISTRY - 1A Basics of Organic Chemistry	COCC1.1: Elementary idea of acid-base chemistry leads to Arrhenius theory, Bronsted-Lowry theory, and Lewis theory.
	COCC1.2: Redox reaction: It gives the idea about whether the reaction is oxidized or reduced and what factors influence on it.
	COCC1.3: It gives the idea of spatial arrangement, properties, reactivity, hybridization and structure of organic molecules, Basic idea about Molecular Orbital Theory (MOT) and reaction mechanism, An understanding of nucleophiles, electrophiles, electronegativity, and resonance.
Practicals: INORGANIC CHEMISTRY-1 Acid and Base Titrations Oxidation-Reduction Titrations ORGANIC CHEMISTRY - 1A Separation of solid mixture	COCC1.4: To develop the skill of basic manual of quantitative analyses of inorganic mixtures.
	COCC1.5: It helps to develop the hand-on skill to determine the nature of the organic compounds on the basis of acid-base treatment.
CEMA-CC-1-2	
PHYSICAL CHEMISTRY-1 Kinetic theory, Chemical kinetics ORGANIC CHEMISTRY - 1B Stereochemistry	COCC2.1: It gives the idea of ideal and real gases, kinetic energy and its variation of temperature and pressure.
	COCC2.2: Its deal with laws of thermodynamics, concept of heat and work, enthalpy, internal energy, entropy, free energy, work functions, and spontaneity of the reaction.
	COCC2.3: It gives the basic idea of three dimensional arrangements of the molecules, their stereochemical features, idea of stereoisomerism (enantiomerism, diastereoisomerism) and the basic idea of resolution and racemisation.
Practicals: PHYSICAL CHEMISTRY-1 Physical Experiments ORGANIC CHEMISTRY - 1B Determination of boiling point	COCC2.4: Calibrate the apparatus like volumetric flask, pipette and burette. Understand the determination of heat of solution, equivalent weight, surface tension, viscosity etc.
	COCC2.5: It helps to develop laboratory training to use melting point and boiling apparatuses.



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of liquid	
Semester 2	
CEMA-CC-2-3	
ORGANIC CHEMISTRY -2 Stereochemistry II General Treatment of Reaction Mechanism III	COCC3.1: Advanced idea of stereochemistry leads to axial chirality, topicity, prochirality etc. and the conformational analysis of the molecules.
	COCC3.2: Idea of reaction thermodynamics, acid-base equilibria and tautomerism. Basic concept of reaction kinetics includes kinetic isotope effect and KCP vs TCP.
	COCC3.3: Detailed discussion of nucleophilic substitution (S_N1 , S_N2) along with NGP and S_N^i .
	COCC3.4: Stereochemical and regiochemical outcome of elimination (E1, E2, E1CB) reactions.
Practical: Organic Preparations	COCC3.5: The basic skill of organic synthesis through the preparation methodology.
CEMA-CC-2-4	
INORGANIC CHEMISTRY-2 Chemical Bonding-I Chemical Bonding-II Radioactivity	COCC4.1: The role of structure of atom in chemistry and it can successfully explain the law of chemical combination and radioactivity
	COCC4.2: Chemical Bonding helps us the information about shape of molecule, its hybridization and reactivity.
	COCC4.3: MOT gives the idea about bond order, bond length, magnetic property, structure and reactivity of the molecules.
Practical: Iodo-/ Iodimetric Titrations Estimation of metal content in some selective samples	COCC4.4: Learn how to estimate the metal content in alloy or ores and develop the skill of iodometric titrations.



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PO AND CO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO3A.1.	√	√				√		
CO3A.2.	√	√	√					
CO3A.3.	√	√	√	√		√		
CO3B.1.	√	√				√		
CO3B.2.	√		√	√	√			
CO3B.3.	√	√						
CO3B.4.	√		√					
CO4A.1.	√	√	√	√				
CO4A.2.	√							
CO4A.3.	√	√	√					
CO4B.1.	√	√	√	√		√	√	√
CO4B.2.	√	√			√	√	√	√
CO5.1.	√	√	√	√		√	√	
CO5.2.	√	√				√	√	
CO5.3.	√	√				√	√	
CO6.1.	√	√						
CO6.2.	√	√	√	√	√			
CO6.3.	√	√				√	√	
CO6.4.	√	√				√	√	√
CO7.1.	√	√						



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CO7.2.	√	√	√					
CO7.3.	√	√			√	√	√	
CO7.4.	√	√				√	√	√
CO8.1.	√	√	√			√	√	√
CO8.2.	√	√	√		√	√	√	√
CO8.3.	√	√				√	√	√
COCC1.1.	√							
COCC1.2.	√		√	√	√			
COCC1.3.	√		√					
COCC1.4.	√	√	√			√	√	√
COCC1.5.	√	√	√			√	√	√
COCC2.1.	√		√	√				
COCC2.2.	√		√	√				
COCC2.3.	√		√	√				
COCC2.4.	√	√			√	√	√	√
COCC2.5.	√	√			√	√	√	√
COCC3.1.	√		√	√	√			
COCC3.2.	√		√	√	√			
COCC3.3.	√		√	√	√			
COCC3.4.	√	√				√	√	√
COCC3.5.	√	√				√	√	√
COCC4.1.	√							
COCC4.2.	√		√		√			



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COCC4.3.	√		√		√			
COCC4.4.	√	√				√	√	√