

# BARASAT GOVT COLLEGE

## UNDER GRADUATE DEPARTMENT OF CHEMISTRY

### B.Sc. Chemistry (Hons) CBCS Syllabus

With effect from 2018-19

#### Program Outcome (PO)

PO 1	Disciplinary knowledge
PO 2	Critical thinking
PO 3	Analytical reasoning
PO 4	Problem Solving
PO 5	Research-related skills
PO 6	Scientific reasoning
PO 7	Information/digital literacy
PO 8	Sense of inquiry
PO 9	Scientific mindset
PO 10	Moral and Ethical Awareness

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## UNDER GRADUATE DEPARTMENT OF CHEMISTRY

### B.Sc. Chemistry (Hons) CBCS Syllabus

With effect from 2018-19

#### Program Specific Outcome (PSO)

- **PSO1:** Understand the basic concepts, principles and applications of chemistry, viz. Physical, organic and inorganic.
- **PSO2:** Set up physicochemical experiments, analyse the data, draw plots, calculate physical constants and interpret the results.
- **PSO3:** Estimate and analyse inorganic compounds both qualitatively and quantitatively and learn the use of analytical instruments
- **PSO4:** Prepare, purify and estimate organic compounds and interpret the NMR and IR data.
- **PSO5:** Learn the basic tenants of computer programming and use of data processing software.
- **PSO6:** Prepare and deliver a PowerPoint presentation on the topics learned during the program.
- **PSO7:** Learn the safety precautions and maintenance protocols of a chemistry laboratory and work cohesively in a group.

**BARASAT GOVERNMENT COLLEGE**  
**Course Outcome or Learning Outcome**  
**Three year B.A. /B.Sc. Degree Course**  
**Under CBCS semester system**  
**HONOURS COURSE IN CHEMISTRY**  
**With effect from the session: 2018 – 2019**

**Course Name:** Core Course-1  
**Course Code:** CEMACOR01T & CEMACOR01P  
**Topic Name:** ORGANIC CHEMISTRY-I

CO, PO & PSO Mapping					
Course Outcome:	SI No	Course outcome	Knowledge level Blooms Level	POs Mapping	PSOs mapping
	CO1	Learns about the Basics of Organic Chemistry like Bonding and Physical Properties, Valence Bond Theory;	L2 Understanding	1,2,3,5,6,9	1,4,5,6,7
	CO2	Understands the General Treatment of Reaction Mechanism like Mechanistic classification and Reactive intermediates	L2 Understanding	1,2,3,5,6,9	1,4,5,6,7
	CO3	Applies the knowledge to solve problems on stereochemistry	L3 Applying	1,2,3,4,5,6,9	1,4,5,6,7
	CO4	Analyzes and understands the Stereochemistry and Bonding geometries of carbon compounds and representation of molecules,	L4 Annalysing	1,2,3,5,6,9	1,4,5,6,7
	CO5	Identifies and separates some organic compounds	L3 Applying	1,2,3,5,6,9	1,4,5,6,7
	CO6	Formulates methods of identifying chiral achiral compounds	L6 Creating	1,2,3,5,6,9	1,4,5,6,7

Program Articulation Matrix (CO-PO Matrix)																			
PO \ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CO1	3	3	2		3	3			1		3			3	2	2	2		
CO2	3	2	3		2	3			2		3			1	3	1	1		
CO3	3	3	2	2	3	2			2		3			3	1	2	3		
CO4	3	2	2		2	1			3		3			2	1	3	3		
CO5	3	3	3		3	3			2		3			3	2	2	2		
CO6	3	1	1		1	1			2		3			3	1	2	2		
Average	3.00	2.33	2.17	2.00	2.33	2.17			2.00		3.00			2.50	1.67	2.00	2.17		

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**HONOURS COURSE IN CHEMISTRY**  
**With effect from the session: 2018 – 2019**

**Course Name:** Core Course-2  
**Course Code:** CEMACOR02T & CEMACOR02P  
**Topic Name:** PHYSICAL CHEMISTRY-1

CO, PO & PSO Mapping					
Course Outcome:	SI No	Course outcome	Knowledge level Blooms Level	POs Mapping	PSOs mapping
	CO1	Identify the distribution of speed and energy of gas molecules and the difference in behaviour of real and ideal gas	L3 Applying	1,2,3,5,6,9	1,2,5,6,7
	CO2	Understand three laws of thermodynamics, the condition of spontaneity and equilibria of a chemical process and the principles of	L2 Understanding	1,2,3,5,6,9	1,2,5,6,7
	CO3	Apply the laws of thermochemistry to solve problem	L3 Applying	1,2,3,4,5,6,9	1,2,5,6,7
	CO4	Analyze the factors that affect rate of a reaction, the theories of reaction rates and the concept of chemical catalysis	L4 Analysing	1,2,3,5,6,9	1,2,5,6,7
	CO5	Evaluate rate constants of reactions, heat of neutralization and pH of buffers through hands on experimentation	L5 Evaluating	1,2,3,5,6,9	1,2,5,6,7
	CO6	Solve problems based on the course	L6 Creating	1,2,3,4,5,6,9	1,2,5,6,7

Program Articulation Matrix (CO-PO Matrix)																			
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CO1	3	3	2		2	2			2		3	1			2	2	1		
CO2	3	2	3		2	2			3		3	3			2	3	3		
CO3	3	3	2	2	2	2			2		3	2			3	3	2		
CO4	3	2	2		2	2			1		3	3			2	2	1		
CO5	3	3	3		2	2			3		3	3			1	1	2		
CO6	3	2	2	3	2	2			1		3	3			2	2	3		
Average	3.00	2.50	2.33	2.50	2.00	2.00			2.00		3.00	2.50			2.00	2.17	2.00		

**BARASAT GOVERNMENT COLLEGE**  
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**HONOURS COURSE IN CHEMISTRY**  
**With effect from the session: 2018 – 2019**

**Course Name:** Core Course-3  
**Course Code:** CEMACOR03T & CEMACOR03P  
**Topic Name:** INORGANIC CHEMISTRY - L

CO, PO & PSO Mapping					
Course Outcome:	SI No	Course outcome	Knowledge level Blooms Level	POs Mapping	PSOs mapping
	CO1	Understand Atomic structure from both Classical and Quantum Mechanical view points	L2 Understanding	1,2,3,5,6,8,9	1,3,5,6,7
	CO2	Identify Chemical periodicity	L3 Applying	1,2,3,5,6,8,9	1,3,5,6,7
	CO3	Comprehend Acid base reactions	L2 Understanding	1,2,3,5,6,8,9	1,3,5,6,7
	CO4	Analyze Redox and precipitation reactions	L4 Annalysing	1,2,3,5,6,8,9	1,3,5,6,7
	CO5	Evaluate and perform quantitative estimations of various metal ions like Fe (II), Fe (III), Cu (II), Mn (II) etc. using redox titration	L5 Evaluating	1,2,3,5,6,8,9	1,3,5,6,7
	CO6	Solve mathematical problems based on Acid-base and Red-ox reactions	L3 Applying	1,2,3,4,5,6,9	1,3,5,6,7

Program Articulation Matrix (CO-PO Matrix)																			
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CO1	3	3	3		2	2		1	2		3		3		2	2	3		
CO2	3	2	1		2	1		2	3		3		3		3	1	2		
CO3	3	3	2		3	2		3	1		3		2		2	2	3		
CO4	3	1	3		3	3		2	2		3		3		1	3	2		
CO5	3	3	2		1	2		1	3		3		1		2	1	2		
CO6	3	2	1	2	3	3			2		3		3		2	2	1		
Average	3.00	2.33	2.00	1.00	2.33	2.17		1.80	2.17		3.00		2.50		2.00	1.83	2.17		

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**HONOURS COURSE IN CHEMISTRY**  
**With effect from the session: 2018 – 2019**

**Course Name:** Core Course-4  
**Course Code:** CEMACOR04T & CEMACOR04P  
**Topic Name:** ORGANIC CHEMISTRY- II

CO, PO & PSO Mapping					
Course Outcome:	SI No	Course outcome	Knowledge level Blooms Level	POs Mapping	PSOs mapping
	CO1	Identify Stereochemistry (a) Chirality arising out of stereo axis (b) Concept of prostereoisomerism (c) Prostereogenic centre and Conformation	L3 Applying	1,2,3,5,6,9	1,4,5,6,7
	CO2	Understand the General Treatment of Reaction Mechanism like (a) Reaction thermodynamics (b) Concept of organic acids and bases (c) Tautomerism (d) Reaction kinetics	L2 Understanding	1,2,3,5,6,9	1,4,5,6,7
	CO3	Apply the knowledge for understanding Substitution and Elimination Reactions like (a) Free-radical substitution reaction (b) Nucleophilic substitution reactions (c) Elimination reactions	L3 Applying	1,2,3,5,6,9	1,4,5,6,7
	CO4	Analyze reactions based on their mechanism	L4 Annalysing	1,2,3,5,6,9	1,4,5,6,7
	CO5	Evaluate the stereochemistry of compound and classify it.	L5 Evaluating	1,2,3,5,6,9	1,4,5,6,7
	CO6	Design and Synthesize some organic compounds followed by their purification.	L6 Creating	1,2,3,5,6,9	1,4,5,6,7

Program Articulation Matrix (CO-PO Matrix)																			
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CO1	3	3	2		2	1			2		3			3	2	2	3		
CO2	3	1	1		1	1			1		3			1	2	3	1		
CO3	3	2	1		3	2			3		3			3	1	2	2		
CO4	3	3	2		2	3			3		3			2	3	2	3		
CO5	3	2	3		3	1			1		3			3	1	1	2		
CO6	3	2	2		3	3			3		3			3	2	2	2		
Average	3.00	2.17	1.83		2.33	1.83			2.17		3.00			2.50	1.83	2.00	2.17		

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**HONOURS COURSE IN CHEMISTRY**  
**With effect from the session: 2018 – 2019**

Course Name: Core Course-5

Course Code: CEMACOR05T & CEMACOR05P

Topic Name: PHYSICAL CHEMISTRY - II

CO, PO & PSO Mapping					
Course Outcome:	SI No	Course outcome	Knowledge level Blooms Level	POs Mapping	PSOs mapping
	CO1	Identify the different transport processes viz. diffusion, viscosity, conduction etc. and the application of conductance measurements in estimating several physical parameters	L3 Applying	1,2,3,5,6,8,9	1,2,5,6,7
	CO2	Understand the Concept of chemical potential and equilibrium constant of a process and the factors affecting them.	L2 Understanding	1,2,3,5,6,8,9	1,2,5,6,7
	CO3	Understand the Development of quantum mechanics and apply its basic postulates to model systems like particle in a box and simple harmonic	L2 Understanding	1,2,3,5,6,8,9	1,2,5,6,7
	CO4	Analyze the data obtained from experiment to arrive a values for viscosity of liquid	L4 Annalysing	1,2,3,5,6,8,9	1,2,5,6,7
	CO5	Hands on experience in using conductivity bridge to estimate dissociation constantof acid and strength of acids, rate constant of reactions etc	L6 Creating	1,2,3,4,5,6,9	1,2,5,6,7
	CO6	Create graphs and plots to analyze experimental data	L6 Creating	1,2,3,4,5,6,9	1,2,5,6,7

Program Articulation Matrix (CO-PO Matrix)																			
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CO1	3	3	2		2	2		2	2		3	1			2	2	2		
CO2	3	2	3		3	2		3	3		3	3			2	3	2		
CO3	3	1	2		3	1		2	2		3	2			3	1	1		
CO4	3	3	3		2	2		1	1		3	3			1	2	3		
CO5	3	2	1	2	3	2			3		3	3			2	2	1		
CO6	3	3	2	2	1	3			2		3	3			3	2	2		
Average	3.00	2.33	2.17	2.00	2.33	2.00		2.00	2.17		3.00	2.50			2.17	2.00	1.83		

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**Course Name:** Core Course-6  
**Course Code:** CEMACOR06T & CEMACOR06P  
**Topic Name:** INORGANIC CHEMISTRY - LL

CO, PO & PSO Mapping					
Course Outcome:	SI No	Course outcome	Knowledge level Blooms Level	POs Mapping	PSOs mapping
	CO1	Remember the useful aspects of ionic and covalent bonds	L1 Remembering	1,2,3,5,6,9	1,3,5,6,7
	CO2	Understand the details of Molecular Orbital theorem including metallic bond	L2 Understanding	1,2,3,5,6,9	1,3,5,6,7
	CO3	Understand weak chemical forces and analyze their beautiful reflection in various chemical and biochemical systems	L2 Understanding	1,2,3,5,6,9	1,3,5,6,7
	CO4	Apply radio chemistry in various fields like chemistry, biology, medicine, agriculture and industry including its safety measure	L3 Applying	1,2,3,5,6,9	1,3,5,6,7
	CO5	Apply known methods to estimate Vit.C, Cu(II), arsenite, Cu in brass and Cr & Mn in steel by Iodometrically Iodimetrically	L3 Applying	1,2,3,5,6,7,9	1,3,5,6,7
	CO6	Design complicated MO diagrams of heteroatomic molecules	L6 Creating	1,2,3,5,6,7,9	1,3,5,6,7

Program Articulation Matrix (CO-PO Matrix)																			
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CO1	3	3	2		2	2			2		3		3		2	2	3		
CO2	3	2	1		1	3			2		3		1		1	3	2		
CO3	3	2	3		2	1			3		3		2		3	1	2		
CO4	3	3	2		3	2			2		3		3		3	3	3		
CO5	3	1	3		3	2	3		1		3		3		3	2	1		
CO6	3	3	2		3	3	2		3		3		3		2	2	3		
Average	3.00	2.33	2.17		2.33	2.17	2.50		2.17		3.00		2.50		2.33	2.17	2.33		



**BARASAT GOVERNMENT COLLEGE**  
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**HONOURS COURSE IN CHEMISTRY**  
**With effect from the session: 2018 – 2019**

Course Name: Core Course-7

Course Code: CEMACOR07T & CEMACOR07P

Topic Name: ORGANIC CHEMISTRY-III

CO, PO & PSO Mapping					
Course Outcome:	SI No	Course outcome	Knowledge level Blooms Level	POs Mapping	PSOs mapping
	CO1	Learn Chemistry of alkenes and alkynes. Addition to C=C: mechanism, Addition to C≡C	L1 Remembering	1,2,3,4,5,6,9	1,4,5,6,7
	CO2	Understand Aromatic Substitution Electrophilic aromatic substitution: Ipso substitution. Nucleophilic aromatic substitution: cine substitution, benzyne mechanism	L2 Understanding	1,2,3,4,5,6,9	1,4,5,6,7
	CO3	Apply the knowledge to understand Carbonyl and Related Compounds. Addition to C=O: Exploitation of acidity of α-H of C=O: Elementary ideas of GreenChemistry: Substitution at sp <sup>2</sup> carbon (C=O system): mechanism : BAC2, AAC2, AAC1, AAL1	L3 Applying	1,2,3,4,5,6,9	1,4,5,6,7
	CO4	Analyze Organometallics Grignard reagent; Organolithiums; Gilman cuprates: Corey-House synthesis; abnormal behavior of Grignard reagents Organocopper reagents; Reformatsky reaction; Blaise reaction; concept of umpolung and base- nucleophile dichotomy in case of organometallic reagents	L4 Annalysing	1,2,3,4,5,6,9	1,4,5,6,7
	CO5	Evaluate qualitatively a single solid organic compound.	L5 Evaluating	1,2,3,4,5,6,9	1,4,5,6,7
	CO6	Formulate techniques to identify different reaction mechanisms.	L6 Creating	1,2,3,4,5,6,9	1,4,5,6,7

Program Articulation Matrix (CO-PO Matrix)																			
PO \ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CO1	3	3	2	1	2	2			2		1			1	2	2	2		
CO2	3	3	3	1	3	1			1		3			3	3	1	1		
CO3	3	2	2	2	1	2			3		2			3	1	2	3		
CO4	3	2	1	3	3	3			2		3			2	2	3	2		
CO5	3	1	3	3	3	2			1		2			3	3	3	3		
CO6	3	3	1	2	3	1			2		3			3	3	1	2		
Average	3.00	2.33	2.00	2.00	2.50	1.83			1.83		2.33			2.50	2.33	2.00	2.17		

**BARASAT GOVERNMENT COLLEGE**  
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**HONOURS COURSE IN CHEMISTRY**  
**With effect from the session: 2018 – 2019**

Course Name: Core Course-8

Course Code: CEMACOR08T & CEMACOR08P

Topic Name: PHYSICAL CHEMISTRY III

CO, PO & PSO Mapping					
Course Outcome:	SI No	Course outcome	Knowledge level Blooms Level	POs Mapping	PSOs mapping
	CO1	Learn the applications of thermodynamic principles in colligative properties of solutions and phase rule	L1 Remembering	1,2,3,5,6,8,9	1,2,5,6,7
	CO2	Understand the Principles of electrochemistry and its application in determining physical parameters	L2 Understanding	1,2,3,5,6,8,9	1,2,5,6,7
	CO3	Apply Quantum mechanical treatment to rigid rotor and H-atom system and concept of angular momentum	L3 Applying	1,2,3,5,6,8,9	1,2,5,6,7
	CO4	Analyze and interpret Potentiometric and pH metric data	L4 Annalysing	1,2,3,5,6,8,9	1,2,5,6,7
	CO5	Evaluate values of pKa and Standard potential from graphs	L5 Evaluating	1,2,3,5,6,8,9	1,2,5,6,7
	CO6	Formulate and solve problems based on the course	L6 Creating	1,2,3,5,6,8,9	1,2,5,6,7

Program Articulation Matrix (CO-PO Matrix)																			
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CO1	3	3	2		2	2		2	2		3	1			2	2	1		
CO2	3	3	2		3	1		2	1		3	3			3	2	2		
CO3	3	2	1		1	2		3	2		3	2			1	1	1		
CO4	3	3	2		2	3		2	1		3	3			2	2	2		
CO5	3	2	1		3	2		1	3		3	3			3	2	3		
CO6	3	1	3		3	3		1	3		3	3			2	3	2		
Average	3.00	2.33	1.83		2.33	2.17		1.83	2.00		3.00	2.50			2.17	2.00	1.83		

**BARASAT GOVERNMENT COLLEGE**  
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**HONOURS COURSE IN CHEMISTRY**  
**With effect from the session: 2018 – 2019**

**Course Name:** Core Course-9  
**Course Code:** CEMACOR09T & CEMACOR09P  
**Topic Name:** INORGANIC CHEMISTRY III

CO, PO & PSO Mapping					
Course Outcome:	SI No	Course outcome	Knowledge level Blooms Level	POs Mapping	PSOs mapping
	CO1	Identifying of the fundamental problems of extracting and purification of metals from their ores	L3 Applying	1,2,3,5,6,7,9	1,3,5,6,7
	CO2	Understanding of chemistry of S and P block elements and their comparative studies	L2 Understanding	1,2,3,5,6,7,9	1,3,5,6,7
	CO3	Applying the knowledge in learning of different chemistry of elements and inorganic polymers	L3 Applying	1,2,3,5,6,7,9	1,3,5,6,7
	CO4	Analyzing and learning of different complex salts formation and their isomerism	L4 Annalysing	1,2,3,5,6,7,9	1,3,5,6,7
	CO5	Prepare several inorganic complexes of different metal ions and evaluate them by complexo-metric titration	L3 Applying	1,2,3,5,6,7,9	1,3,5,6,7
	CO6	Naming of different complex following IUPAC rules	L6 Creating	1,2,3,5,6,7,9	1,3,5,6,7

Program Articulation Matrix (CO-PO Matrix)																			
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CO1	3	3	2		2	1	3		2		3		3		2	2	2		
CO2	3	3	1		3	2	2		1		3		3		2	2	3		
CO3	3	2	2		2	3	3		3		3		2		3	1	2		
CO4	3	3	1		1	2	1		2		3		3		2	3	1		
CO5	3	3	3		3	1	3		3		3		3		3	2	2		
CO6	3	1	3		3	3	1		3		3		1		1	1	3		
Average	3.00	2.50	2.00		2.33	2.00	2.17		2.33		3.00		2.50		2.17	1.83	2.17		

**BARASAT GOVERNMENT COLLEGE**  
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**With effect from the session: 2018 – 2019**

**Course Name:** Core Course-10  
**Course Code:** CEMACOR10T & CEMACOR10P  
**Topic Name:** CEMACORE T10: ORGANIC CHEMISTRY-IV

CO, PO & PSO Mapping					
Course Outcome:	SI No	Course outcome	Knowledge level Blooms Level	POs Mapping	PSOs mapping
	CO1	Learn about Nitrogen compounds	L1 Remembering	1,2,3,5,6,8,9	1,4,5,6,7
	CO2	Understand Rearrangements Reactions	L2 Understanding	1,2,3,5,6,8,9	1,4,5,6,7
	CO3	Apply the Logic of Organic Synthesis (Retrosynthesis)	L3 Applying	1,2,3,5,6,8,9	1,4,5,6,7
	CO4	Analyze Organic Spectroscopy, UV Spectroscopy, IR Spectroscopy, NMR Spectroscopy data	L4 Annalysing	1,2,3,5,6,8,9	1,4,5,6,7
	CO5	Estimate glucose, vitamin C, aromatic amines, phenol, formaldehyde, acetic acid, urea and saponification value of oil.	L5 Evaluating	1,2,3,5,6,8,9	1,4,5,6,7
	CO6	Formulate methods to identify compounds from spectroscopic data	L6 Creating	1,2,3,5,6,8,9	1,4,5,6,7

Program Articulation Matrix (CO-PO Matrix)																			
PO \ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CO1	3	3	2		2	2		3	2		3			1	2	2	2		
CO2	3	3	3		3	2		2	1		3			3	1	2	3		
CO3	3	1	2		3	1		3	1		3			2	2	1	1		
CO4	3	3	3		1	2		2	3		3			3	3	3	2		
CO5	3	2	1		3	1		2	2		3			3	2	2	2		
CO6	3	1	1		2	3		1	3		3			3	3	2	3		
Average	3.00	2.17	2.00		2.33	1.83		2.17	2.00		3.00			2.50	2.17	2.00	2.17		

**BARASAT GOVERNMENT COLLEGE**  
**Course Outcome or Learning Outcome**  
**Three year B.A. /B.Sc. Degree Course**  
**Under CBCS semester system**  
**HONOURS COURSE IN CHEMISTRY**  
**With effect from the session: 2018 – 2019**

**Course Name:** Core Course-11  
**Course Code:** CEMACOR11T & CEMACOR11P  
**Topic Name:** INORGANIC CHEMISTRY-IV

CO, PO & PSO Mapping					
Course Outcome:	SI No	Course outcome	Knowledge level Blooms Level	POs Mapping	PSOs mapping
	CO1	Learn about Coordination chemistry, magnetism, colour , spectra and calculation of CFSE	L1 Remembering	1,2,3,4,5,6,9	1,3,5,6,7
	CO2	Understand Chemistry of transition elements, Lanthanoids and Actinoids	L2 Understanding	1,2,3,4,5,6,9	1,3,5,6,7
	CO3	Apply knowledge in estimating ions in solution gravimetrically	L3 Applying	1,2,3,4,5,6,9	1,3,5,6,7
	CO4	Analyze and evaluate through Spectrophotometry and paper chromatographic separation of some ions and gravimetric estimation of nickel, copper, aluminium and chloride	L4 Annalysing	1,2,3,4,5,6,9	1,3,5,6,7
	CO5	Evaluate CFSE of different complex through Spectrophotometry	L5 Evaluating	1,2,3,4,5,6,9	1,3,5,6,7
	CO6	Formulate technique to estimate 10Dq of a complex	L6 Creating	1,2,3,4,5,6,9	1,3,5,6,7

Program Articulation Matrix (CO-PO Matrix)																			
PO \ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CO1	3	3	2	3	2	2			2		3		3		2	2	1		
CO2	3	3	3	2	3	2			2		3		3		2	1	3		
CO3	3	1	2	3	1	1			1		3		2		1	2	2		
CO4	3	3	1	2	2	3			2		3		3		3	2	3		
CO5	3	3	2	1	3	2			3		3		1		2	3	3		
CO6	3	2	1	1	3	3			3		3		3		3	2	3		
Average	3.00	2.50	1.83	2.00	2.33	2.17			2.17		3.00		2.50		2.17	2.00	2.50		

**BARASAT GOVERNMENT COLLEGE**  
**Course Outcome or Learning Outcome**  
**Three year B.A. /B.Sc. Degree Course**  
**Under CBCS semester system**  
**HONOURS COURSE IN CHEMISTRY**  
**With effect from the session: 2018 – 2019**

Course Name: Core Course-12

Course Code: CEMACOR12T & CEMACOR12P

Topic Name: ORGANIC CHEMISTRY-V

CO, PO & PSO Mapping					
Course Outcome:	SI No	Course outcome	Knowledge level Blooms Level	POs Mapping	PSOs mapping
	CO1	Identify Polynuclear hydrocarbons and their derivatives: Heterocyclic compounds: Cyclic Stereochemistry	L5 Evaluating	1,2,3,5,6,8,9	1,4,5,6,7
	CO2	Understand Pericyclic reactions: Electrocyclic reactions: Cycloaddition reactions: Sigmatropic reactions	L2 Understanding	1,2,3,5,6,8,9	1,4,5,6,7
	CO3	Apply the knowledge in understanding structure of Carbohydrates and Biomolecules	L3 Applying	1,2,3,5,6,8,9	1,4,5,6,7
	CO4	Analyze 1H NMR and IR spectra of some compounds	L4 Annalysing	1,2,3,5,6,8,9	1,4,5,6,7
	CO5	Evaluate compounds using methods of chromatography and purification like TLC, column and paper chromatography	L5 Evaluating	1,2,3,5,6,9,10	1,4,5,6,7
	CO6	Prepare derivatives of a compound.	L6 Creating	1,2,3,5,6,9,10	1,4,5,6,7

Program Articulation Matrix (CO-PO Matrix)																			
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CO1	3	3	2		2	2		1	2		3			1	2	2	1		
CO2	3	1	1		3	3		2	2		3			3	2	2	3		
CO3	3	2	2		2	1		3	1		3			3	3	1	2		
CO4	3	3	3		1	2		2	3		3			2	1	2	3		
CO5	3	2	2		3	3			2	3	3			3	2	3	2		
CO6	3	3	3		3	2			3	2	3			3	3	2	2		
Average	3.00	2.33	2.17		2.33	2.17		2.00	2.17	2.50	3.00			2.50	2.17	2.00	2.17		

**BARASAT GOVERNMENT COLLEGE**  
**Course Outcome or Learning Outcome**  
**Three year B.A. /B.Sc. Degree Course**  
**Under CBCS semester system**  
**HONOURS COURSE IN CHEMISTRY**  
**With effect from the session: 2018 – 2019**

Course Name: Core Course-13

Course Code: CEMACOR13T & CEMACOR13P

Topic Name: INORGANIC CHEMISTRY

CO, PO & PSO Mapping					
Course Outcome:	SI No	Course outcome	Knowledge level Blooms Level	POs Mapping	PSOs mapping
	CO1	Learning about the essential and beneficial elements in the biological systems	L1 Remembering	1,2,3,5,6,8,9	1,3,5,6,7
	CO2	Understanding the importance of different biological proteins of Human body	L2 Understanding	1,2,3,5,6,8,9	1,3,5,6,7
	CO3	Applying the different techniques of toxification and detoxification of metals and get a clear idea about Chelation therapy	L3 Applying	1,2,3,5,6,8,9	1,3,5,6,7
	CO4	Analyzing different organo-metallic compounds and their industrial applications as catalysts	L4 Annalysing	1,2,3,5,6,8,9	1,3,5,6,7
	CO5	Evaluating different inorganic reaction mechanisms and kinetics	L5 Evaluating	1,2,3,5,6,9,10	1,3,5,6,7
	CO6	Being able to qualitatively detect and analysis of different anions and cations in practical classes.		1,2,3,5,6,9,10	1,3,5,6,7

Program Articulation Matrix (CO-PO Matrix)																			
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CO1	3	3	2		2	2		1	2		3		3		2	2	3		
CO2	3	3	1		3	1		3	2		3		1		1	2	1		
CO3	3	2	2		2	2		3	3		3		3		3	1	3		
CO4	3	3	2		1	3		2	1		3		2		3	2	2		
CO5	3	2	2		3	3			2	2	3		3		2	2	1		
CO6	3	1	3		3	2			3	3	3		3		3	2	3		
Average	3.00	2.33	2.00		2.33	2.17		2.25	2.17	2.50	3.00		2.50		2.33	1.83	2.17		

**BARASAT GOVERNMENT COLLEGE**  
**Course Outcome or Learning Outcome**  
**Three year B.A. /B.Sc. Degree Course**  
**Under CBCS semester system**  
**HONOURS COURSE IN CHEMISTRY**  
**With effect from the session: 2018 – 2019**

**Course Name:** Core Course-14  
**Course Code:** CEMACOR14T & CEMACOR14P  
**Topic Name:** PHYSICAL CHEMISTRY IV

CO, PO & PSO Mapping					
Course Outcome:	SI No	Course outcome	Knowledge level Blooms Level	POs Mapping	PSOs mapping
	CO1	Identify and remember the principles of Molecular Spectroscopy rotational, vibrational , Raman, NMR and ESR spectroscopy.	L5 Evaluating	1,2,3,5,6,8,9	1,2,5,6,7
	CO2	Understand the basic principles of photochemistry, different photochemical processes and the	L2 Understanding	1,2,3,5,6,8,9	1,2,5,6,7
	CO3	Apply the concepts of surface tension on the properties of surface , adsorption, colloids etc.	L3 Applying	1,2,3,5,6,8,9	1,2,5,6,7
	CO4	Analyze kinetics of a reaction spectrophotometrically and Beer and Lambert"s Law	L4 Annalysing	1,2,3,5,6,9,10	1,2,5,6,7
	CO5	Evaluate surface tension of a liquid and measure the CMC of a surfactant	L5 Evaluating	1,2,3,5,6,9,10	1,2,5,6,7
	CO6	Construct plots and graphs to estimate rate constant from spectroscopic methods	L6 Creating	1,2,3,4,5,6,9,10	1,2,5,6,7

Program Articulation Matrix (CO-PO Matrix)																			
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CO1	3	3	2		2	2		2	1		3	3			2	2	1		
CO2	3	2	2		1	1		3	1		3	2			1	2	2		
CO3	3	3	1		2	2		2	3		3	1			3	1	3		
CO4	3	2	3		3	2			3	3	3	3			2	2	1		
CO5	3	3	2		3	2			2	2	3	3			3	3	3		
CO6	3	1	1		3	2			3	1	3	3			3	3	2		
Average	3.00	2.33	1.83		2.33	1.83		2.33	2.17	2.00	3.00	2.50			2.33	2.17	2.00		



**BARASAT GOVERNMENT COLLEGE**  
**Course Outcome or Learning Outcome**  
**Three year B.A. /B.Sc. Degree Course**  
**Under CBCS semester system**  
**HONOURS COURSE IN CHEMISTRY**  
**With effect from the session: 2018 – 2019**

**Course Name:** Discipline Specific Elective-1  
**Course Code:** CEMADSE01T  
**Topic Name:** ADVANCED PHYSICAL CHEMISTRY

CO, PO & PSO Mapping					
Course Outcome:	SI No	Course outcome	Knowledge level Blooms Level	POs Mapping	PSOs mapping
	CO1	Learn the laws of crystallography, lattice structure of crystalline solids and the basic theory behind the X-ray crystallography.	L1 Remembering	1,2,3,4,5,6,9	1,2,5,6,7
	CO2	Understand preliminary concepts of statistical thermodynamics, Boltzmann distribution, molecular partition function and thermodynamic properties	L2 Understanding	1,2,3,4,5,6,9	1,2,5,6,7
	CO3	Apply the knowledge previously gained to understand about specific heat of solids, Einstein's theory and Debye's T-cubed law and third law of thermodynamics.	L3 Applying	1,2,3,4,5,6,9	1,2,5,6,7
	CO4	Analyze and compare the different theories of specific heat of solids.	L4 Annalysing	1,2,3,4,5,6,9	1,2,5,6,7
	CO5	Evaluate degree of polymerization and the kinetics of polymerization	L5 Evaluating	1,2,3,4,5,6,9	1,2,5,6,7
	CO6	Create simple programs using Fortran language	L6 Creating	1,2,3,4,5,6,9	1,2,5,6,7

Program Articulation Matrix (CO-PO Matrix)																			
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CO1	3	3	2	3	2	2			2		3	3			1	2	1		
CO2	3	1	2	2	1	3			3		3	3			2	3	1		
CO3	3	2	1	2	3	1			1		3	2			1	1	2		
CO4	3	2	3	1	2	1			2		3	3			3	2	1		
CO5	3	3	2	3	3	2			3		3	1			2	2	2		
CO6	3	3	3	2	3	3			2		3	3			3	2	3		
Average	3.00	2.33	2.17	2.17	2.33	2.00			2.17		3.00	2.50			2.00	2.00	1.67		

**BARASAT GOVERNMENT COLLEGE**  
**Course Outcome or Learning Outcome**  
**Three year B.A. /B.Sc. Degree Course**  
**Under CBCS semester system**  
**HONOURS COURSE IN CHEMISTRY**  
**With effect from the session: 2018 – 2019**

Course Name: Discipline Specific Elective-2

Course Code: CEMADSE02T

Topic Name: ANALYTICAL METHODS IN CHEMISTRY

CO, PO & PSO Mapping					
Course Outcome:	SI No	Course outcome	Knowledge level Blooms Level	POs Mapping	PSOs mapping
	CO1	Gain knowledge about sampling methods and sampling errors. They get to know about accuracy and precision, normal law of distribution and they can apply these concepts to solve numerical problems	L2 Understanding	1,2,3,5,6,9	1,2,3,5,6,7
	CO2	Understand the optical methods of analysis viz., UV-vis, IR, flame AAS and flame AES and their principles and applications in estimation of metal ions, geometrical isomers, keto-enol tautomerism and composition of metal complexes.	L2 Understanding	1,2,3,5,6,9	1,2,3,5,6,7
	CO3	Apply thermal and electroanalytical methods in various estimations and separation techniques like solvent extraction and chromatographic methods	L3 Applying	1,2,3,5,6,9	1,2,3,5,6,7
	CO4	Evaluate BOD and COD of water and perform soil analysis	L5 Evaluating	1,2,3,5,6,9	1,2,3,5,6,7
	CO5	Use separation methods of paper and thin layer chromatography, solvent extraction and ion exchange techniques	L3 Applying	1,2,3,5,6,9	1,2,3,5,6,7
	CO6	Report Rf values using paper chromatography	L5 Evaluating	1,2,3,5,6,9	1,2,3,5,6,7

Program Articulation Matrix (CO-PO Matrix)																			
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CO1	3	3	2		2	2			1		3	1	2		2	2	1		
CO2	3	3	2		3	2			1		3	3	3		2	1	1		
CO3	3	2	2		1	3			3		3	1	2		1	2	2		
CO4	3	3	1		3	1			2		3	2	3		3	3	2		
CO5	3	2	2		2	2			3		3	2	2		2	1	3		
CO6	3	1	1		3	3			2		3	1	1		3	2	3		
Average	3.00	2.33	1.67		2.33	2.17			2.00		3.00	1.67	2.17		2.17	1.83	2.00		

**BARASAT GOVERNMENT COLLEGE**  
**Course Outcome or Learning Outcome**  
**Three year B.A. /B.Sc. Degree Course**  
**Under CBCS semester system**  
**HONOURS COURSE IN CHEMISTRY**  
**With effect from the session: 2018 – 2019**

Course Name: Discipline Specific Elective-3

Course Code: CEMADSE04T

Topic Name: GREEN CHEMISTRY

CO, PO & PSO Mapping					
Course Outcome:	SI No	Course outcome	Knowledge level Blooms Level	POs Mapping	PSOs mapping
	CO1	Identify the basic principles of green chemistry, its importance to minimize the use of hazardous chemicals, atomeconomy, and precautions taken for generation of toxic byproducts during chemical reactions	L5 Evaluating	1,2,3,4,5,6,9	1,4,5,6,7
	CO2	Understand different industrially important synthesis in less polluted way and future trends of green chemistry forsustainable development for better world	L2 Understanding	1,2,3,4,5,6,9	1,4,5,6,7
	CO3	Perform hands on experiments using non toxic materials and water like green solvent	L6 Creating	1,2,3,4,5,6,9	1,4,5,6,7
	CO4	Apply the knowledge to use alternative source of energy in typical green synthesis by avoiding maximum chemical wastage	L3 Applying	1,2,3,4,5,6,9	1,4,5,6,7
	CO5	Analyze the impact of hazardous chemicals in the environment	L4 Annalysing	1,2,3,4,5,6,9	1,4,5,6,7
	CO6	Create and design experiments with green solvents	L6 Creating	1,2,3,4,5,6,9	1,4,5,6,7

Program Articulation Matrix (CO-PO Matrix)																			
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CO1	3	3	1	2	3	2			2		3			3	2	1	2		
CO2	3	2	2	2	2	1			3		3			1	2	2	3		
CO3	3	3	2	1	1	2			1		3			3	2	2	1		
CO4	3	2	3	3	3	3			3		3			3	1	1	2		
CO5	3	1	2	2	2	2			2		3			2	3	3	3		
CO6	3	3	2	3	3	3			1		3			3	3	3	2		
Average	3.00	2.33	2.00	2.17	2.33	2.17			2.00		3.00			2.50	2.17	2.00	2.17		

**BARASAT GOVERNMENT COLLEGE**  
**Course Outcome or Learning Outcome**  
**Three year B.A. /B.Sc. Degree Course**  
**Under CBCS semester system**  
**HONOURS COURSE IN CHEMISTRY**  
**With effect from the session: 2018 – 2019**

**Course Name:** Discipline Specific Elective-4  
**Course Code:** CEMADSE05T  
**Topic Name:** INORGANIC MATERIAL OF INDUSTRIAL IMPORTANCE

CO, PO & PSO Mapping					
Course Outcome:	SI No	Course outcome	Knowledge level Blooms Level	POs Mapping	PSOs mapping
	CO1	Learn the procedure of preparation of cement, ceramics and glass and their uses	L1 Remembering	1,2,3,5,6,9	1,3,5,6,7
	CO2	Gain In- depth understanding of the different chemical properties of cement, ceramics and glass	L2 Understanding	1,2,3,5,6,9	1,3,5,6,7
	CO3	Identify the procedure of preparation of important fertilizers and oils, paints, dyes and pigments	L5 Evaluating	1,2,3,5,6,9	1,3,5,6,7
	CO4	Estimate the utility of using different catalysts in different chemical reactions including chemical explosives	L4 Annalysing	1,2,3,5,6,9	1,3,5,6,7
	CO5	Apply the procedure in preparing different types of batteries and alloys	L3 Applying	1,2,3,5,6,9	1,3,5,6,7
	CO6	Formulate and synthesize different type of N-P-K fertilizers	L6 Creating	1,2,3,5,6,9	1,3,5,6,7

Program Articulation Matrix (CO-PO Matrix)																			
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CO1	3	3	2		2	1			2		3		3		2	2	3		
CO2	3	2	2		3	3			3		3		1		1	1	2		
CO3	3	2	1		2	1			1		3		3		1	3	2		
CO4	3	3	3		3	3			2		3		2		2	3	1		
CO5	3	1	2		1	1			1		3		3		2	1	2		
CO6	3	3	3		3	3			3		3		3		3	2	3		
Average	3.00	2.33	2.17		2.33	2.00			2.00		3.00		2.50		1.83	2.00	2.17		

**BARASAT GOVERNMENT COLLEGE**  
**Course Outcome or Learning Outcome**  
**Three year B.A. /B.Sc. Degree Course**  
**Under CBCS semester system**  
**HONOURS COURSE IN CHEMISTRY**  
**With effect from the session: 2018 – 2019**

Course Name: Skill Enhancement Course-1

Course Code: CEMSSEC01M

Topic Name: BASIC ANALYTICAL CHEMISTRY

CO, PO & PSO Mapping					
Course Outcome:	SI No	Course outcome	Knowledge level Blooms Level	POs Mapping	PSOs mapping
	CO1	Gain knowledge of precision and accuracy	L1 Remembering	1,2,3,5,6,9	1,2,3,5,6,7
	CO2	Learn about the constituents of soil and water	L2 Understanding	1,2,3,5,6,9	1,2,3,5,6,7
	CO3	Understand the method of Analysis of food products and cosmetics	L2 Understanding	1,2,3,5,6,9	1,2,3,5,6,7
	CO4	Apply the Principles of chromatography in different types of Chromatography - paper, TLC, column and ion exchange and separation of mixtures	L3 Applying	1,2,3,5,6,9	1,2,3,5,6,7
	CO5	Analyze soil and water samples	L4 Annalysing	1,2,3,5,6,9	1,2,3,5,6,7
	CO6	: Prepare paper and TLC plates to separate ions, paint samples	L6 Creating	1,2,3,5,6,9	1,2,3,5,6,7

Program Articulation Matrix (CO-PO Matrix)																			
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CO1	3	3	2		1	2			1		3	1	1		2	2	1		
CO2	3	3	3		2	1			1		3	1	3		1	2	3		
CO3	3	2	2		3	3			2		3	1	2		2	2	2		
CO4	3	1	1		3	2			3		3	2	3		3	2	3		
CO5	3	2	3		3	2			3		3	1	3		3	2	1		
CO6	3	3	2		3	3			2		3	3	3		2	2	3		
Average	3.00	2.33	2.17		2.50	2.17			2.00		3.00	1.50	2.50		2.17	2.00	2.17		

**BARASAT GOVERNMENT COLLEGE**  
**Course Outcome or Learning Outcome**  
**Three year B.A. /B.Sc. Degree Course**  
**Under CBCS semester system**  
**HONOURS COURSE IN CHEMISTRY**  
**With effect from the session: 2018 – 2019**

**Course Name:** Skill Enhancement Course-2  
**Course Code:** CEMSSEC02M  
**Topic Name:** ANALYTICAL CLINICAL BIOCHEMISTRY

CO, PO & PSO Mapping					
Course Outcome:	SI No	Course outcome	Knowledge level Blooms Level	POs Mapping	PSOs mapping
	CO1	Learn about the essential features of carbohydrates and proteins	L1 Remembering	1,2,3,5,6,9	1,4,5,6,7
	CO2	Understand structure , utility and inhibition of enzymes	L2 Understanding	1,2,3,5,6,9	1,2,4,5,6,7
	CO3	Apply the knowledge to identify different forms of enzyme inhibition	L3 Applying	1,2,3,5,6,9	1,2,5,6,7
	CO4	Conceptualize the essentials of lipids and lipoproteins	L2 Understanding	1,2,3,5,6,9	1,4,5,6,7
	CO5	Evaluate the diagnostic approach by blood and urine analysis.	L5 Evaluating	1,2,3,5,6,9	1,2,4,5,6,7
	CO6	Create table of different mono, di and polysachharides	L6 Creating	1,2,3,5,6,9	1,4,5,6,7

Program Articulation Matrix (CO-PO Matrix)																			
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CO1	3	3	2		2	2			2		3			3	1	2	3		
CO2	3	3	3		1	3			3		3	1		2	3	2	1		
CO3	3	2	2		3	2			1		3	2			2	1	2		
CO4	3	3	3		2	1			2		3			2	1	2	3		
CO5	3	1	1		3	3			3		3	1		2	3	2	2		
CO6	3	3	2		3	1			2		3			3	2	2	3		
Average	3.00	2.50	2.17		2.33	2.00			2.17		3.00	1.33		2.40	2.00	1.83	2.33		