গড়গাঁও মহাবিদ্যালয়

GARGAON COLLEGE

TEACHING PLAN

DEPARTMENT OF CHEMISTRY

JULY 2020 - JUNE 2021

GARGAON COLLEGE
TEACHING PLAN
Course: B. Sc.
Session: Odd semester 2020

Subject: CHEMISTRY
Name of the Teacher: Mr. RANJIT DUTTA
Methods to be applied: Lecture, analytical and activity method, Group Work, Assessment for Learning, Assignments and Exercises, Group Activities and Discussions and Assessments.
Teaching Materials: White Board, Marker, Duster, text books, lectures, etc.

Paper Code/Title	**Allotted Unit/ Topic**	**No. of Classes required**	**Detail of the topics to be taught & class required**	**No. of tutorials**
Inorganic Chemistry C-101	Unit III: Chemical Bonding	26	● Ionic bond: General characteristics, types of ions, size effects, radius ratio rule and its limitations. [2] ● Packing of ions in crystals. Born-Lande equation with derivation, lattice energy, Madelung constant [2] ● Born-Haber cycle and its application, Solvation energy. [2] ● Covalent bond: Lewis structure, Valence Bond theory (Heitler-London approach). [2] ● Energetics of hybridization, equivalent and non-equivalent hybrid orbitals. Resonance and resonance energy [2] ● Molecular orbital theory. Molecular orbital diagrams of diatomic and simple polyatomic molecules N_2, O_2, C_2, B_2, F_2, CO, NO, and their ions; HCl, BeF_2, CO_2, (idea of s-p mixing and orbital interaction to be given). Formal charge [4] ● Valence shell electron pair repulsion theory (VSEPR), shapes of simple molecules and ions containing lone pairs and bond pairs of electrons, multiple bonding (σ- and π- bond approach) and bond lengths. [3] ● Covalent character in ionic compounds, polarizing power and polarizability. Fajan's rules and consequences of polarization. [2] ● Ionic character in covalent compounds: Bond moment and dipole moment. Percentage ionic character from dipole moment and electronegativity difference. [2] ● Metallic Bond: Qualitative idea of valence bond and band theories. Semiconductors and insulators, defects in solids. [2]	3

			● Weak Chemical Forces: van der Waals forces, ion-dipole forces, dipole-dipole interactions, induced dipole interactions, Instantaneous dipole-induced dipole interactions. Hydrogen bonding (theories of hydrogen bonding, valence bond treatment) [3]	
CHEMISTRY-C-101-LAB	Inorganic Chemistry	30	● Titrimetric analysis ● Acid-base titrations ● Oxidation-reduction titrimetry	1
CHEMISTRY-GE-101-LAB	Inorganic Chemistry Lab	30	● Inorganic Volumetric Analysis [30]	1
CHEMISTRY-C-301	Unit III: Chemistry of s and p Block Elements	30	● Inert pair effect, Relative stability of different oxidation states, diagonal relationship anomalous behaviour of first member of each group. [12] ● Allotropy and catenation. Complex, formation tendency of *s* and *p* block elements [5] ● Chemistry of Boron, Carbon, Nitrogen, Oxygen, halogens, Phosphorus, Sulphur. [13]	2
CHEMISTRY-C-301-LAB	Inorganic Lab	26	● Inorganic Qualitative analysis	2
MM-503	UNIT – II: Transition metal clusters	10	● Definition of cluster, metal – metal bond in cluster, synthesis of metal carbonyl cluster of Cr, Fe and Mo (only low nuclearity clusters up to 4 metal atoms). [3] ● Closed shell electronic requirement for cluster compounds –rules for Polyhedral Skeletal Electron Pair Theory. [3] ● Nitrosyl compounds: Synthesis, properties and structures of nitrosyls of Fe, Co and Ni [4]	2
MM-504	Inorganic Lab.	16	● Volumetric titrations ● Estimation of total hardness of water samples	1
MM-508	Inorganic Lab.	18	● Quantitative analysis	1

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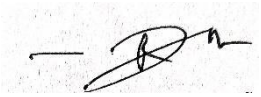
CHEMISTRY C-401	Unit I: Coordination Chemistry	26	● IUPAC nomenclature of coordination compounds, isomerism in coordination compounds [4] ● Stereochemistry of complexes with 4 and 6 coordination numbers. Chelate effect, polynuclear complexes. Labile and inert complexes [2] ● Werner's theory, valance bond theory (inner and outer orbital complexes), electroneutrality principle and back bonding [5] ● Crystal field theory, measurement of 10Dq (Δ_o), CFSE in weak and strong fields, pairing energies, factors affecting the magnitude of 10Dq (Δ_o, Δ_t) [7] ● Octahedral vs. tetrahedral coordination, tetragonal distortions from octahedral geometry [3] ● Jahn-Teller theorem, square planar geometry [2] ● Qualitative aspect of Ligand field and MO Theory [3]	2
CHEMISTRY-C-401-LAB	Inorganic Chemistry practical	28	● Gravimetric Analysis [8] ● Inorganic Preparation [8] ● Chromatography of metal ions [8] ● Viva-voce [4]	2
CHEMISTRY-GE-401	Section A: Inorganic Chemistry	8	● Valence Bond Theory (VBT): Inner and outer orbital complexes of Cr, Fe, Co, Ni and Cu (coordination numbers 4 and 6) [4] ● Structural and stereoisomerism in complexes with coordination numbers 4 and 6. Drawbacks of VBT [3]	2

	Unit II: Coordination Chemistry		● IUPAC (2005) system of nomenclature [1]	
CHEMISTRY-GE-401-LAB	Inorganic Chemistry Practical	20	● Qualitative Inorganic Analysis: Salt analysis [18] ● Viva – voce [2]	2
MM-603	UNIT – III: Chromatographic Methods	10	● Paper, Thin layer, Column [3] ● Gas chromatography – separation of compounds, development and R_f values. [4] ● HPLC – principle only [3]	1
MM-604	Inorganic Lab.	18	● Inorganic preparation & Crystallization	1



Signature of Faculty

GARGAON COLLEGE

TEACHING PLAN

Course: B. Sc.

Session: Odd semester 2020

Subject: CHEMISTRY

Name of the Teacher: DR. ANNA GOGOI

Methods to be applied: Lecture, analytical and activity method, interaction and discussion.

Teaching Materials: Green Board, Chalk Pencil, Duster, Book, Journal

PaperCode/Title	**Allotted Unit/ Topic**	**No. of Class required**	**Detail of the topics to be taught & class required**	**No. of tutorials**
CHEMISTRY C-102	Unit I: Liquid State	6	● Qualitative treatment of the structure of the liquid state [1] ● Radial distribution function [1] ● physical properties of liquids : vapour pressure, Surface tension, viscosity [4]	3

			• Explanation of cleansing action of detergents [1]	
	UNIT:IV Ionic equilibrium	20	• Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization [2] • ionization constant and ionic product of water [4] • pH scale, common ion effect; dissociation constants of mono-, di-and triprotic acids (exact treatment) [5] • Salt hydrolysis, Henderson equation [4] • Buffer solutions, solubility product [4]	3
CHEMISTRY C102-LAB	Physical Chemistry	10	• Surface tension measurements [4] • Determination of viscosity [4] • pH-metric titration [8]	5
CHEMISTRY -C-303	UNIT: II Chemical Kinetics	18	• Order and molecularity of a reaction, rate laws [2] • Zero, First and Second order reaction [4] • steady-state approximation [1] • complex reactions, Opposing reactions, parallel reactions, consecutive reactions, chain reactions [8] • Arrhenius equation, activation energy, Collision theory of reaction rates [3] • Lindemann mechanism, absolute reaction rates [3]	5
CHEMISTRY -C-303-LAB	Physical Chemistry Practical	28	• Acid hydrolysis of methyl acetate with hydrochloric acid [4] • Saponification of ethyl acetate [4] • Verify the Freundlich and Langmuir isotherms for adsorption of acetic acid on activated charcoal [6]	3

CHEMISTRY GE-301	UNIT: 3 Conductance	6	● Conductivity, equivalent and molar conductivity [2] ● Kohlrausch's law, Transference number, Hittorf method, Moving boundary methods [4] ● Ionic mobility, solubility and solubility products of sparingly soluble salts, hydrolysis constant of a salt. Conductometric titrations [6]	2
CHEMISTRY GE-301 Lab	Section A: Physical Chemistry	10	● Cell constant [2] ● conductometric titration [8]	2
MM 501	Unit I –Chemical Kinetics	15	● Molecularity and order of reactions, elementary and complex reactions rate laws [3] ● differential and integral forms of rate equations of zero,1st, 2nd order reactions, half life periods of 1st and 2nd order reactions, [5] ● first order, opposite, parallel, consecutive reaction, chain reactions, chain branching, explosion limit, hydrogen – bromine thermal reaction Arrhenius equation, energy of activation, collision theory of bimolecular reactions, its limitation, [6] ● activated complex theory, Eyring equation, Lindeman's theory of unimolecular gas phase reaction [5]	4
MM 502 Physical Lab	Physical Chemistry Practical	28	● pH metric titrations of (i) Strong acid and strong base (ii) Weak acid and strong base max values ● To determine the concentration of an optically active substance by polarimetric methodconcentration of KMnO4	5

			• To determine the specific reaction rate of hydrolysis of methyl acetate catalyzed by hydrogen ion concentration at room temperature • Conductometric titration of (i) Strong acid and strong base (ii) Strong acid and weak base • Viva Voce [2]	

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CHEMISTRY - C-202	UNIT: I Chemical Thermodynamics	36	● Intensive and extensive variables; state and path functions; isolated, closed and open systems [3] ● zeroth law of thermodynamics [2] ● First law: Concept of heat, q, work, w, internal energy, U [3] ● enthalpy, H, heat capacities [3] ● enthalpy, H, relation between heat capacities, calculations of q, w, U and H for free expansion of gases (ideal and van der Waals) under isothermal and adiabatic conditions [6] ● Heats of reactions: standard states; enthalpy of formation of molecules and ions [4] ● bond energy, bond dissociation energy and resonance energy [3] ● Adiabatic flame temperature, explosion temperature [3] ● Second Law: Concept of entropy [4] ● Calculation of entropy change for reversible and irreversible processes [4] ● Third Law, Gibbs and Helmholtz energy, Free energy change and spontaneity [5] ● Gibbs-Helmholtz equation; Maxwell relations [5]	4

CHEMISTRY - C-202 Lab	Physical Chemistry Laboratory	12	• Determination of heat capacity of the calorimeter and enthalpy of neutralization of hydrochloric acid with sodium hydroxide[4] • Calculation of the enthalpy of ionization of ethanoic acid [4] • Study of the solubility of benzoic acid in water and determination of Δ H.[4]	4
CHEMISTRY- C- GE- 201	UNIT: 3 Ionic Equilibrium	12	• Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization [4] • ionization constant and ionic product of water [2] • Ionization of weak acids and bases [2] • pH scale, common ion effect, Salt hydrolysis [3] • Buffer solutions, Solubility and solubility product of sparingly soluble salts[4]	3
CHEMISTRY -C- GE-201 Lab	Section A: Physical Chemistry	15	• Determination of heat capacity [4] • Calculation of the enthalpy of ionization of ethanoic acid.[4] • Study of the solubility of benzoic acid in water[4]	3
CHEMISTRY - C-403	UNIT: 1 Conductance	20	• Arrhenius theory of electrolytic dissociation, Conductivity, equivalent and molar conductivity [4] • Kohlrausch law of independent migration of ions, Debye-Hückel-Onsager equation [3] • Wien effect, Debye-Falkenhagen effect, Walden's rules [2] • Ionic velocities, mobilities, transference number and its determination, Hittorf method, Moving Boundary method [6] • degree of dissociation of weak electrolytes, ionic product of water, hydrolysis constants of salts and conductometric titrations[6]	3
CHEMISTRY - C-403 -LAB	Physical Chemistry Practical	16	• Determination of cell constant [4] • conductometric titrations [12] • Viva Voce [3]	4
CHEMISTRY -GE-401	UNIT: V Liquids	6	• surface tension and its determination [2]	1

			• Viscosity of a liquid and its determination [2] • Effect of temperature on surface tension and coefficient of viscosity of a liquid [2]	
	UNIT: VII Chemical Kinetics	8	• The concept of reaction rates, Effect of temperature, pressure, catalyst and other factors on reaction rates [2] • Order and molecularity of a reaction, Zero order reaction, First order reaction, Second order reaction [4] • Half–life of a reaction, determination of order of a reaction [2] • activation energy and its calculation from Arrhenius equation [1] • Collision theory and Activated Complex theory [2]	2
CHEMISTRY -GE-401-LAB	Section B: Physical Chemistry Practical	12	• Determination of the surface tension [6] • Determination of viscosity of liquid [6] • Viva Voce [3]	2
MM 601	Unit II- Macromolecules	15	• Step reaction polymerization, degree of polymerization, addition polymerization, free radical polymerization, anionic [5] • anionic, cationic polymerization [2] • carother equation, Zeigler Natta catalysts, Co-polymerisation [4]	4
	Unit V -Statistical Thermodynamics	13	• tatistical methods (Basic ideas)- Boltzmann method (or Maxwell- Boltzmann statistics) [3] • BoseEinstein statistics, Fermi Dirac statistics, [2] • Stirling approximation, Boltzmann distribution law, Partition function, Total molecular partition function [5] • relationship between molar partition function and molecular partition function, expression for thermodynamic function in terms of molar partition function [3]	

			• rotational and vibrational partition functions [2]	
MM 602 Physical Lab	Physical Chemistry Experiment		• To study the rate constant of hydrolysis of sucrose by polarimeter [2] • To study the distribution of iodine between CCl4 and water. [3] • To obtain Freundlich isotherm for adsorption of oxalic acid on activated charcoal [2]	
MM 608	Project Work	48	• Project Work [48]	6

Signature of Faculty

GARGAON COLLEGE
TEACHING PLAN
Course: B. Sc.
Session: Odd semester 2020

Subject: **CHEMISTRY**
Name of the Teacher**: Dr. Arandao Narzary**
Methods to be applied: Lecture, practical demonstration, interaction and discussion.
Teaching Materials: White Board, Marker Pen, Duster, Book, Journal, Laptop, Projector, Pointer

Paper Code/Title	**Allotted Unit/ Topic**	**No. of Class required**	**Detail of the topics to be taught & class required**	**No. of tutorials**

CHEMISTRY GE-101	Unit IV: Stereochemistry	11	• Conformation with respect to ethane, butane and cyclohexane[1]. • Interconversion of projection formula[2] • Concept of chirality[1] • Configuration: Geometrical[2] • Optical isomerism; Enantiomerism Diastereomerism and Meso Compounds[2] • Threo and erythro; D and L; Cis-trans nomenclature[1] • CIP Rules: R/S and E/Z Nomenclature[2]	4
	Unit V: Aliphatic Hydrocarbons	8	• Alkanes: Preparation: and Reactions[2] • Alkenes: Preparation: Elimination reactions: Dehydration of alkenes and dehydrohalogenation of alkyl halides (Saytzeff's rule)[4] • Reactions: cis-addition (alk. KMnO4) and trans-addition (bromine), Addition of HX(Markownikoff's and anti Markownikoff's addition), Hydration, Ozonolysis[4]	3
CHEMISTRY GE-101-LAB	Organic Chemistry practical	18	Section B: Organic Chemistry • Detection of characterized element (N, S, Cl, Br, I) in an organic compound • Separation of mixtures by Chromatography • Viva [2]	4

Organic Chemistry C-302	Unit-I Chemistry of Halogenated Hydrocarbons	16	Alkyl halides ● Methods of preparation including Hunsdiecker reaction from silver or lead (IV) salts of carboxylic Acid)[2] ● Nucleophilic substitution reactions: SN1, SN2, and SNi. Nucleophilic substitution vs elimination. Haloform reaction[5] ● Aryl halides: Preparation from diazonium salts[1] ● Nucleophilic Aromatic Substitution SNAr, Benzyne intermediates[3] ● Relative reactivity of alkyl, allyl /aenzyl, vinyl and aryl halides towards nucleophilic substitution reactions[3] Organometallic Compounds: ● Mg and Li - Use in synthesis of organic compounds[3]	3
	Unit-III Carbonyl Compounds: Aldehydes and ketones (aliphatic and aromatic)	18	● Structure, Preparation and Reactions Relative reactivity of aldehydes, ketones,Nucleophilic addition reactions[2] ● Mechanism of Aldol, Benzoin, Stobbe, Darzen glycidic ester condensation, Perkin, Cannizzaro reaction. Beckmann and Benzil-Benzilic acid rearrangement, substitution, oxidation and reduction, Clemmensen, Wolf-Kishner and M P V reduction[10] ● Addition reactions of unsaturated carbonyl Compound: Michal addition. Unsaturated aldehydes (Acrolein, Crotonaldehyde, Cinnamaldehyde) Unsaturated ketone (MVK)[4] ● Active methylene compounds: Keto-enol tautomerism. Preparation and synthetic applications of diethyl malonate and ethyl acetoacetate[2]	4

Organic Chemistry C- 302 LAB	Organic Chemistry practical	12	• Organic Prepartions[10 • Viva Voce [2]	6
Organic Chemistry GE- 301	Unit VII: Carbohydrates	8	• Carbohydrates: Classification, and General Properties[2] • Determination of configuration of monosaccharides, absolute configuration of Glucose and Fructose[4] • Mutarotation, ascending and descending in monosaccharides[2]	4
	Unit VIII: Amino Acids, Peptides and Proteins	10	• Preparation of Amino Acids: Strecker synthesis using Gabriel's phthalimide synthesis[2] • Zwitterion, Isoelectric point and Electrophoresis[2] • Reactions of Amino acids[2] • Overview of Primary, Secondary, Tertiary and Quaternary Structure of proteins[4]	4
Chemistry GE- 301-Lab	Section B: Organic Chemistry practical	14	• Systematic Qualitative Organic Analysis of Organic Compounds[12] • Viva[2]	4
Organic Chemistry-III MM 505	Unit-I Pericyclic reactions:	12	• Definition. The conservation of orbital symmetry, Woodward-Hofmann Rules, HOMO-LUMO approach.[3] • Cyclo addition reactions: (2+2) and (2+4) cycloadditions[2] • Diels Alder Reaction, 1,3- dipolar cycloaddition[1] • Sigma tropic rearrangements -Cope and Claisen rearrangement[3] • Electrocyclic reactions[3]	4
	Unit-II Bio-molecules	12	• Carbohydrates- Occurrence, classification and biological importance[1]	4

			• General properties of glucose and fructose (open and cyclic structure)[1] • Monosaccharides: Constitution and absolute configuration of glucose and fructose[4] • Epimerization, Mutarotation[1] • Determination of ring size of glucose. Haworth projections and conformational structures[2] • Ascending and descending in monosaccharides, Interconversions of Aldoses and Ketoses[3]	
	Unit-III Nucleic acids & Enzymes	10	• Components of Nucleic acids, Nucleosides and Nucleotides. Structure Synthesis and Reactions of Adenine, Guanine, Cytosine, Uracil & Thymine. Polynucleotides: Structure of DNA and RNA, Genetic code. Biological roles of DNA and RNA, Replication. Transcription and Translation [6] • Enzymes and their functions as catalyst – Classification- Active site, Specificity, Mechanism of Enzyme action, Co-enzyme, Application of Enzymes[4]	2
	Unit-IV Pharmaceutical compounds: Structure and Importance	12	• Introduction to natural and synthetic medicinal compounds: Azadirachtin (neem), Curcumin(haldi), Vitamin C- their medicinal values, Drug action[3] • Classification, structure, preparation and therapeutic uses of Antipyretics: Paracetamol[2] • Analgesic: Aspirin, Ibuprofens[2] • Antimalerials: Chloroquine[1] • Antacids: Ranitidine[1] • Antibacterial: povidone –Iodine solutions[1] • Sulphanilamide and other sulphadrugs[1]	2

			• An elementary treatment of Antibiotics and detailed study of chloramphenicol[12]	
	Unit-V Terpenes	7	• Occurrence, classification Isoprene Rule[2] • Elucidations of structure and synthesis of Citral, Neral and α-Terpineol[5]	1
Organic ChemistryMM 506-LAB	Organic Chemistry practical	8	Organic Quantitative analysis • Determination amount of glucose by titration with Fehling's solution[2] • ii) Determination of equivalent mass of an acid by direct titration method[1] • Determination of glycine by formal titration [1] Food Analysis [2] Viva [2]	4

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Organic Chemistry C-201	Unit II: Stereochemistry	16	• Definition and classification of stereoisomers [1] • Representation of organic molecules in two & three dimensions[2]	4

			● Geometrical isomerism: Physical & Chemical properties of Geometrical isomers [2] ● Cis–trans and, syn-anti isomerism, E/Z notations with C.I.P rules[2] ● Optical Isomerism: Optical Activity, Specific Rotation, Chirality/Asymmetry, Enantiomers[2] ● Diastereoisomers, meso structures & Epimers[2] ● Racemic mixture and resolution, Threo & Erythro forms, Relative and absolute configuration[2] ● D/L and R/S designations[3]	
	Unit III: Chemistry of Aliphatic Hydrocarbons	4 14	A. Carbon-Carbon sigma bond ● Chemistry of alkanes: Formation and Reactions [2] ● Halogenation -relative reactivity and selectivity[2] B. Carbon-Carbon pi bonds: ● Formation of alkenes and alkynes by elimination reactions[2] ● Mechanism of E1, E2, E1cb ● reactions of alkene [8] ● 1,2-and 1,4-addition reactions in conjugated dienes and, Diels-Alder reaction[2] ● Allylic and benzylic bromination and mechanism[1] ● Reactions of alkynes[1]	1 6
Organic Chemistry C2 -Lab	Organic Chemistry Practical	12	● Purification of organic compounds by crystallization using the following solvents[3] ● Determination of the melting points of above compounds and unknown organic compounds [3] ● Chromatography[4]	4

			• Viva[2]	
Chemistry GE-201	Section B: Organic Chemistry Unit IV: Aromatic Hydrocarbons	8	• Preparation and Reactions of aromatic hydrocarbons (Case benzene)[6] • Side chain oxidation of alkyl benzenes (up to 4 carbons on benzene)[2]	2
	Unit V: Alkyl and Aryl Halides	8	• Alkyl Halides: (Up to 5 Carbons) preparation[1] • Nucleophilic Substitution (SN1, SN2 and SNi)[2] • Reactions of alkyl halides[1] • Aryl Halides: Preparation: (Chloro, bromo and iodo-benzene case) and Aromatic nucleophilic substitution reaction[2] • Benzyne Mechanism[1] • Reactivity and Relative strength of C-Halogen bond in alkyl, allyl, benzyl, vinyl and aryl halides[1]	4
Chemistry GE-201 -Lab	Section B: Organic Chemistry:	10	• Purification of organic compounds by crystallization (from water and alcohol) and distillation[3] • Criteria of Purity: Determination of melting and boiling points[2] • Preparations of organic compounds[3] • Viva[2]	4
Organic Chemistry C-402	Unit II: Polynuclear Aromatic Hydrocarbons	12	• Preparation and structure elucidation & Reactions of Polynuclear hydrocarbons : naphthalene, phenanthrene and anthracene , and important derivatives of naphthalene and anthracene[12 •	4

	Unit – V Heterocyclic Compounds	20	• Classification, Nomenclature and structure. Aromaticity in 5-membered and 6-membered rings containing one heteroatom[11] • Synthesis, reactions, properties of furan, pyrrole thiophene,Furfural and furoic acid • Pyridine, Pyrimidine,indole, quinoline, and isoquinoline[9]	2
	Unit V: Terpenes	6	• Occurrence, classification, isoprene rule[2] • Elucidation of stucture and synthesis of Citral, Neral and α-terpineol[6].	4
Organic Chemistry C-402-LAB	Organic Chemistry Practical	14	• Qualitative analysis of unknown organic compounds[12] • Viva[2]	4
Organic Chemistry MM-605	Unit-I Disconnection approach in organic synthesis	10	• Elementary idea about disconnection[1] • Simple examples of reaction leading to C-C bond formation (Corey-House, Wittig & aldol condensation), Retrosynthesis of monofunctionalised compounds[9]	4
	Unit II: Organic Spectroscopy *NMR Spectroscopy:*	15	• Basic principles of Proton Magnetic Resonance[[2] • Chemical shift and factors influencing it; Spin – Spin coupling and coupling constant; Anisotropic effects in alkene, alkyne, aldehydes and aromatics[3] • Interpretation of NMR spectra of simple compounds[2] • Applications of IR, UV, NMR and Mass for identification of simple organicmolecules[8]	2
	Unit-III : Lipids	8	• Classification of Oils and Fats[1] • Structure, properties and biological importance of triglycerides and phosphoglycerides[3] • Change of flavor of oils, Reversion and Rancidity[2]	2

			• Saponification value and Iodine number[2]	
	Unit IV: Dyes	8	• Classification, Colour and constitution; Mordant and Vat Dyes [2] • Synthesis and applications of: Azo dyes – Methyl Orange and Congo Red [1] • Triphenyl Methane Dyes -Malachite Green, Rosaniline and Crystal Violet[1] • Phthalein Dyes – Phenolphthalein and Fluorescein[1] • Natural dyes –structure[1] • Elucidation and synthesis of Alizarin and Indigotin; Edible Dyes with examples [2]	1
Organic Chemistry- MM-606-LAB	Organic Chemistry Practical	16	• Two step organic preparations (monitoring by TLC)	3
Molecular spectroscopy	Unit V Spin resonance spectroscopy	12	• Principle of NMR, chemical shift and low resolutions spectra, different scales[4] • spin-spin coupling and high resolution spectra[2] • Interpretation of PMR spectra of ethanol, 1- and 2-chloropropane, acetaldehyde, cyanohydrin and 1,2 & 1,3-dichloropropane[2] • Electron spin resonance (ESR) spectroscopy and its principle, hyperfine structure, ESR of simple free radicals, and copper (II) compounds[4]	4
CHEMISTRY-MM-608	Dissertation (*Project Work*)	30	• Project Work [30]	2
Chemistry NM-601	UNIT -I Active Methylene Compounds	6	• Synthesis of ethylacetoacetate (Claisen ester condensation)[3] • Diethylmalonate .Synthetic uses of ethylacetoacetate and	2

			diethylmalonate,Keto – enol Tautomerism[3]	
	Unit-III- Preparation, properties and reaction of the Heterocyclic compounds & Polynuclear Hydrocarbon	10	Preparation, properties and reaction of the following Organic Compounds ● Aromatic Sulphonic acids- Benzene sulphonic acid, nitro sulphonic acid, amino sulphonic acid, sulphuryl chloride, saccharin, chloramines-T[2] ● Aromatic nitro compounds- Nitrobenzene, Dinitrobenzene, Nitro toluene, TNT, Reduction of nitro compounds in different conditions[2] ● Heterocyclic compounds- preparation and properties of five and six membered heterocyclic compounds: pyrrole, thiophene, furan, pyridine[3] ● Polynuclear Hydrocarbon : preparation and properties of Naphthalene and anthracene[3]	2
	Unit – IV : Aliphatic & aromatic carbonyl compounds	12	Study of the following reactions (Mechanisms are not required) – Rosenmund reduction, ● Stephen's reduction, Aldol condensation, Claisen condensation, Cannizzaro's reaction, Wittig reaction, Benzoin condensation, Clemmensen reduction and Wolf Kishner reduction, Meerwein– Pondorf – Verley reduction and Haloform reaction[7] ● Aromatic aldehydes & Ketones – Preparation and reactions, Benzaldehyde, Salicyladehyde, Cinnamaldehyde, acetophenone, benzophenone[5]	2
	Unit – V Organic Chemistry of life	12	● Carbohydrates : Classification and General properties[2] ● Amino Acids: classification, preparation and properties Glycine, Alanine and Phenylalanine (Strecker synthesis and Gabriel phthalimide method)[2]	4

			• Reactions of amino acids[2] • Elementary ideas of peptides and proteins[2] • Elementary ideas of nucleoside, nucleotide, nucleic acid (DNA, RNA)[2] • Elementary ideas of enzyme and co-enzyme, lipids and fatty acids[2]	
Chemistry practical NM-602-Lab	A: Organic Lab	8	• Organic preparation[4] • Separation of mixtures by chromatography: Separation, identification and determination of Rf values of the components of a given mixture of two amino acids by paper chromatography[2] • Viva[2]	2

(Signature)

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Course: B. Sc.
Session: Odd semester 2020

Subject: **CHEMISTRY**
Name of the Teacher**: Mr. Rituraj Tahu**
Methods to be applied: Lecture, practical demonstration, interaction and discussion.
Teaching Materials: White Board, Marker Pen, Duster, Book, Journal, Laptop, Projector, Pointer, etc

Paper Code/Title	**Allotted Unit/ Topic**	**No. of Class required**	**Detail of the topics to be taught & class required**	**No. of tutorials**

CHEMISTRY C-302	Unit II: Alcohols, Phenols, Ethers and Epoxides	14	**Alcohols** ● preparation, properties and relative reactivity of 1°, 2°, 3° alcohols Bouvaelt-Blanc Reduction [3] ● Preparation and properties of glycols Oxidation by OsO4, alkaline. KMnO4, periodic acid and lead Tetraacetate Pinacol Pinacolone [3] ● Rearrangement *Trihydric alcohols* : Glycerol /Preparation & Propertie [2] **Phenols** ● Preparation and properties; Acidity and factors effecting it Ring substitution reactions, Reimer–Tiemann and Kolbe's–Schmidt Reactions Fries and Claisen rearrangements with mechanism [3] **Ether and Epoxides** ● Preparation and reactions with acids Reaction of epoxide with alcohols ammonia derivatives and LiAlH4 [3]	4
	Unit IV: Carboxylic Acids and their Derivatives:	12	● Preparation, physical properties and reactions of monocarboxylic acids (Acidity and factors affecting it) Typical reactions of dicarboxylic acids, hydroxy acids and unsaturated acids [4] ● succinic, phthalic, lactic, malic, tartaric, citric, maleic and fumaric acids Preparation and reactions of	7

			acid chlorides, anhydrides, esters and amides [4] ● Comparative study of nucleophilic sustitution at acyl group -Mechanism of acidic and hydrolysis of esters Claisen condensation, Dieckmann and Reformatsky reactions, Hofmann bromamide degradation and Curtius rearrangement [4]	
CHEMISTRY C-302-LAB	Organic Chemistry practical	17	● Functional group tests for alcohols, carbonyl, and carboxylic acid group [8] ● Preparation by Acetylation [1] ● Preparation by Benzolyation [2] ● Preparation by Oxidation [1] ● Preparation by Nitration [1] ● Preparation by Hydrolysis [1] ● Preparation by Benzil-Benzilic acid rearrangement [1] ● Viva Voce [2]	2
CHEMISTRY MM 507	Unit – I: Symmetry and Group theory	18	● Symmetry elements and symmetry operations. Definition of group, symmetry group, point group and space group. [6] ● Perspective sketch and point group of some common molecules (H2, HF, CO2, C2H2, C2H4, CHCl3, PCl5, NH3, BF3, [PtCl4]2-, BrF5), symmetry and mathematical tools, matrix algebra, reducible and irreducible representation, great	8

			orthogonality theorem (deduction not [8] ● Character table for C2v and C3v point groups, Determination of  i for C2v and C3v point groups [4]	
	Unit – II :Quantum Chemistry and Chemical Bonding	25	● Black body radiation – Planck's hypothesis, photoelectric effect, de Broglie hypothesis andHeisenberg's uncertainty principle. Postulates of quantum mechanics, quantum mechanical operators. [5] ● Normalization of wave functions-expectation values. Interpretation of the wave function – orthogonal and ortho normal wave functions. Schrodinger equation and its application to a particle in a box (vigorous treatment one and three dimensional boxes) energy levels, wave functions, probability distribution functions. Nodal properties, degeneracy. [5] ● Qualitative treatment of (i) rigid rotator (ii) harmonic oscillator and (iii) hydrogen atom - Schrodinger equation for hydrogen atom: energy levels and quantum numbers, the radial and angular part of wave functions, two dimensional plots of probability density. [5] ● The hydrogen like wave functions –Stern Gerlach experiment, electron spin and spin quantum numbers, Pauli's exclusion	8

			principle – illustration by He atom.[5]	
CHEMISTRY-GE-101	Unit III: Fundamentals of Organic Chemistry	8	• Physical Effects, Electronic Displacements: Inductive Effect, Electromeric Effect, Resonance and Hyperconjugation. Cleavage of Bonds: Homolysis and Heterolysis [2] • Structure, shape and reactivity of organic molecules: Nucleophiles and electrophiles. Reactive Intermediates: Carbocations, Carbanions and free radicals [2] • Strength of organic acids and bases: Comparative study with emphasis on factors affecting *p*K values. Aromaticity: Benzenoids and Hückel's rule [2]	3
CHEMISTRY-GE-101-LAB	Chemistry Practical	15	• Detection of characterized element (N, S, Cl, Br, I) in an organic compound [10] • Separation of mixtures by Chromatography: Measure the R*f* value in each case [3] • Viva [2]	2
CHEMISTRY-GE-301	*Section B: Organic Chemistry* Unit V: Carboxylic acids	6	• *Carboxylic acids (aliphatic and aromatic)*: Preparation: Acidic and Alkaline hydrolysis of esters. Reactions: Hell – Vohlard - Zelinsky Reaction [2]	3

	and their derivatives		● *Carboxylic acid derivatives (aliphatic): (upto 5 carbons)* Preparation: Acid chlorides, anhydrides, Esters and Amides from acids and their interconversion [2] ● Reactions: Comparative study of nucleophilicity of acyl derivatives. Reformatsky Reaction, Perkin Condensation [2]	
	Unit VI: Amines and Diazonium Salts	6	● *Amines (Aliphatic and Aromatic)*: (Up to 5 carbons): Preparation: from alkyl halides, Gabriel's Phthalimide synthesis, Hofmann Bromamide reaction. Reactions: Hofmann vs. Saytzeff elimination, Carbylamine test, Hinsberg test, with HNO2, Schotten – Baumann Reaction. Electrophilic substitution (case aniline): nitration, bromination, sulphonation [4] ● *Diazonium salts*: Preparation: from aromatic amines. Reactions: conversion to benzene, phenol, dyes [2]	3
CHEMISTRY-GE-301-LAB	Chemistry Practical	10	● Systematic Qualitative Organic Analysis of Organic Compounds[10	2

GARGAON COLLEGE

TEACHING PLAN

Course: B. Sc.

Session: Even semester 2021

Subject: CHEMISTRY

Name of the Teacher: Mr. Rituraj Tahu

Methods to be applied: Lecture, practical demonstration, interaction and discussion.

Teaching Materials: White Board, Marker Pen, Duster, Book, Journal, Laptop, Projector, Pointer.

Paper Code/Title	Allotted Unit/ Topic	No. of Class required	Detail of the topics to be taught & class required	No. of tutorials
CHEMISTRY-C-201	Unit I: Basic Organic Chemistry	8	• *Organic Compounds:* Classification and Nomenclature, Hybridization, Shapes of molecules, Influence of hybridization on bond properties [2] • *Electronic effects:* Inductive, electromeric, resonance and mesomeric effects, hyperconjugation and their applications; Dipole moment [2] • Homolytic and Heterolytic fission with suitable examples. Curly arrow rules, formal charges; Electrophiles and Nucleophiles; Nucleophlicity and basicity; Types, shape and their relative stability of Carbocations, Carbanions, Free radicals and Carbenes, Nitrenes [2] • Organic acids and bases; their relative strength, Hard and soft acids & bases. Energy profile diagrams of one step, two steps & three steps reactions,	4

			Activation energy, Kinetically Controlled & Thermodynamically Controlled reactions [2]	
	Unit IV: Cycloalkanes and Conformational analysis:	10	● Cycloalkanes: Preparation and their relative stability, Baeyer strain theory Conformation analysis of alkanes (Ethane and Butane): Relative stability: Energy diagrams of cyclohexane: Chair, Boat and Twist boat forms; Relative stability with energy diagrams [10]	5
	Unit V: Aromatic Hydrocarbons	12	● *Aromaticity:* Hückel's rule, aromatic character of arenes, cyclic carbocations/carbanions and heterocyclic compounds with suitable examples [5] ● Electrophilic aromatic substitution: halogenation, nitration, sulphonation and Friedel-Craft's alkylation/acylation with their mechanism [4] ● Directing effects of the groups [3]	

CHEMISTRY-C-201-LAB	Organic Chemistry Practical	9	• Purification of organic compounds by crystallization [2] • Determination of the melting points [1] • Effect of impurities on the melting point – mixed melting point of two unknown organic compounds [1] • Separation of a mixture of two amino acids by paper chromatography [1] • Separation of a mixture of two sugars by paper chromatography [1] • Separation of a mixture of o-and p-nitrophenol or o-and p-aminophenol by thin layer chromatography (TLC) [1] • Viva [2]	2
CHEMISTRY-MM 403	Unit-II Nitrogen containing functional groups: Aliphatic and aromatic Amines	8	• Effect of substituent and solvent on basicity. Preparation and properties: Gabriel Phthalimide synthesis and Hoffmann bromamide degradation, carbylamines reaction, Mannich Reaction [2] • Hoffmann's Exhaustive methylation, Hoffmann-Elimination Reaction. Distinction between 1, 2 and 3 amines with Hinesburg reagent and nitrous acid. [2] • Nitro and nitroso compounds, Nitriles and isoritriles, cyanates and isocyanates: Preparation and important reactions. [2] • Diazomethane and diazoacetic ester with synthetic application [1] • Diazonium salts: Preparation and their synthetic applications. [1]	3
	Unit-VI Alkaloids	10	• Classification, Nomenclature and structure. Aromaticity in	

			5-membered and 6-membered rings containing one heteroatom.[3] ● Synthesis, reactions, properties of furan, pyrrole (Paal-knorr synthesis), thiophene, pyridine (Hantzsch synthesis), quinoline (Skraup synthesis.[4] ● Knorr quinoline synthesis, Pfitzinger reaction) and isoquinoline (Bischler-Napieralski reaction. [3]	
Organic Chemistry MM--402-LA B	Organic Chemistry Practical	8	● Chromatographic separation of the following mixtures and calculation of Rf value of the compounds[6] ● Viva[2]	2
CHEMISTRY-MM 605	Unit-II UV-visible Spectroscopy IR Spectroscopy	10	● Application of Woodward rules for calculation of λmax for the following system: α,β-unsaturated aldehydes, ketones. [5] ● Application in functional group analysis.	4
	Unit V: Polymers	8	● Types of polymers- Isotactic, syndiotactic and atactic polymers. Preparation and applications of plastics- [3] ● Thermo-setting (Urea–formaldehyde, Phenol-formaldehyde, polyurethanes and thermo softening (PVC, Polythene) polymer additives.[2] ● Synthetic fibers: Rayon, Nylon-6, terylene, Fabrics- natural and synthetic (acrylic, polyamido, polyester) Rubbers-natural and	4

			synthetic: Buna-S, chloroprene and neoprene, vulcanization[3]	
Organic Chemistry- MM-606-LAB	Organic Chemistry Practical	16	● Two step organic preparations (monitoring by TLC)	3
MM 607	Unit-III Infrared and Raman spectroscopy	18	● Classical equation of vibration, vibrational energies of diatomic molecules, zero point energy, Concepts of normal vibration, force constant, effect of isotopic substitution, vibrational frequency, Fundamental frequencies [5] ● overtones, hot bands, degree of freedom of polyatomic molecules, and concept of group frequencies [5] ● Raman Effect, Polarizability tensor, Stokes and antistokes lines, structure elucidation by Raman spectroscopy (AB, A2B, and AB3), stretching frequencies of bonds and functional groups (Example from both organic and inorganic molecules). [8]	6
	Unit IV Electronic spectroscopy	7	● The Beer – Lambert Law, molar absorption coefficient, selection rules for electronic transitions, vibrational structures [4] ● Franck-Condon principle, chromophores, auxochromes, bathochromic and hypsochromic shift.[3]	3
CHEMISTRY-MM-608	Dissertation (*Project Work*)	30	● Project Work [30]	2

CHEMISTRY-GE-201	Section *B: Organic Chemistry* Unit VI: Alcohols, Phenols and Ethers (Up to 5 Carbons)	8	● *Alcohols*: Preparation: Preparation of 1o, 2o and 3o alcohols: using Grignard reagent, Ester hydrolysis, Reduction of aldehydes, ketones, carboxylic acid and esters. Reactions: With sodium, HX (Luca's test), esterification, oxidation (with PCC, *alk*. KMnO4, acidic dichromate, conc. HNO3). Diols: (Up to 6 Carbons) oxidation of diols. Pinacol-Pinacolone rearrangement [2] ● *Phenols*: (Phenol case): Preparation: Cumene hydroperoxide method, from diazonium salts. Reactions: Electrophilic substitution: Nitration, halogenation and sulphonation. Reimer- Tiemann Reaction, Schotten – Baumann Reaction [2] ● *Ethers (aliphatic and aromatic)* Cleavage of ethers with HI [2] ● *Aldehydes and ketones (aliphatic and aromatic):* (Formaldehye, acetaldehyde, acetone and benzaldehyde): Preparation: from acid chlorides and from nitriles. Reactions – Reaction with HCN, ROH, NaHSO3, NH2-G derivatives. Iodoform test. Aldol Condensation, Cannizzaro's Reaction, Wittig Reaction, Benzoin Condensation. Clemensen Reduction and Wolff Kishner Reduction. Meerwein-Pondorff Verley Reduction [2]	2
CHEMISTRY-GE-201-LAB	Chemistry Practical	5	● *Purification* of organic compounds by crystallization [2] ● Determination of melting and boiling points [1]	2

			● Preparation by Benzoylation of amines/phenols [1] ● Preparation of Oxime and 2, 4-dinitrophenylhydrazone of aldehyde/ketone [1] ● Viva [2]	

Signature of the teacher

GARGAON COLLEGE
TEACHING PLAN
Course: B. Sc.
Session: Odd semester, 2020

Subject: CHEMISTRY
Name of the Teacher: DR. PAKIZA BEGUM
Methods to be applied: Lecture, Group Work, Flipped Classroom, Problem-Based Learning, Experiential Learning, Assessment for Learning, Assignments and Exercises, Group Activities and Discussions, Feedback and Assessments.
Teaching Materials: White Board, Marker, Duster, Laptop, Projector, text books, multimedia, applications, software, digital learning resources including video, audio, text, websites, animations and images, lectures, Online Resources etc.

Paper Code/Title	**Allotted Unit/ Topic**	**No. of Classes required**	**Detail of the topics to be taught & class required**	**No. of tutorials**
Inorganic Chemistry C-101	Unit I: Atomic Structure	14	● Wave mechanics: de Broglie equation, Heisenberg's Uncertainty Principle and its significance, Schrödinger's wave equation, significance of Ψ and Ψ^2. [4] ● Quantum numbers and their significance. Normalized and orthogonal wave functions. Sign of wave functions. [3]	2

			• Radial and angular wave functions for hydrogen atom. Radial and angular distribution curves. [2] • Shapes of s, p, d and f- orbitals. Contour boundary and probability diagrams. [2] • Pauli's Exclusion Principle, Hund's rule of maximum multiplicity, Aufbau's principle and its limitations. Variation of orbital energy with atomic number]. [3]	
	Unit III: Chemical Bonding	26	• Ionic bond: General characteristics, types of ions, size effects, radius ratio rule and its limitations. [2] • Packing of ions in crystals. Born-Lande equation with derivation, lattice energy, Madelung constant [2] • Born-Haber cycle and its application, Solvation energy. [2] • Covalent bond: Lewis structure, Valence Bond theory (Heitler-London approach). [2] • Energetics of hybridization, equivalent and non-equivalent hybrid orbitals. Resonance and resonance energy [2] • Molecular orbital theory. Molecular orbital diagrams of diatomic and simple polyatomic molecules N_2, O_2, C_2, B_2, F_2, CO, NO, and their ions; HCl, BeF_2, CO_2, (idea of s-p mixing and orbital interaction to be given). Formal charge [4] • Valence shell electron pair repulsion theory (VSEPR), shapes of simple molecules and ions containing lone pairs and bond pairs of electrons, multiple bonding (σ- and π- bond approach) and bond lengths. [3] • Covalent character in ionic compounds, polarizing power and polarizability. Fajan's rules and consequences of polarization. [2] • Ionic character in covalent compounds: Bond moment and dipole moment. Percentage ionic character from dipole moment and electronegativity difference. [2] • Metallic Bond: Qualitative idea of valence bond and band theories. Semiconductors and insulators, defects in solids. [2] • Weak Chemical Forces: van der Waals forces, ion-dipole forces, dipole-dipole interactions, induced dipole interactions, Instantaneous dipole-induced dipole interactions. Hydrogen bonding (theories of hydrogen bonding, valence bond treatment) [3]	3

	Unit IV: Oxidation-Reduction	4	● Redox equations, Standard Electrode Potential and its application to inorganic reactions. [2] ● Principles involved in volumetric analysis to be carried out in class. [2]	2
CHEMISTRY-C-101-LAB	Inorganic Chemistry	30	● Titrimetric analysis ● Acid-base titrations ● Oxidation-reduction titrimetry	1
CHEMISTRY-GE-101	Unit I: Atomic Structure	14	● Ionic Bonding: General characteristics of ionic Review of: Bohr's theory and its limitations, dual behaviour of matter and radiation, de-Broglie's relation, Heisenberg Uncertainty principle. [2] ● Hydrogen atom spectra. Need of a new approach to Atomic structure. [2] ● What is Quantum mechanics? Time independent Schrodinger equation and meaning of various terms in it. Significance of Ψ and Ψ^2, Schrödinger equation for hydrogen atom. [2] ● Radial and angular parts of the hydogenic wave functions (atomic orbitals) and their variations for 1s, 2s, 2p, 3s, 3p and 3d orbitals (Only graphical representation). [2] ● Radial and angular nodes and their significance. Radial distribution functions and the concept of the most probable distance with special reference to 1s and 2s atomic orbitals. [2] ● Significance of quantum numbers, orbital angular momentum and quantum numbers m_l and m_s. Shapes of s, p and d atomic orbitals, nodal planes. ● Discovery of spin, spin quantum number (s) and magnetic spin quantum number (ms). Rules for filling electrons in various orbitals, electronic configurations of the atoms. [2] ● Stability of half-filled and completely filled orbitals, concept of exchange energy. Relative energies of atomic orbitals, Anomalous electronic configurations. [2]	4
CHEMISTRY-GE-101-LAB	Inorganic Chemistry	30	● Inorganic Volumetric Analysis [30]	1
Inorganic Chemistry C-301	Unit I: General Principles of Metallurgy	6	● Chief modes of occurrence of metals based on standard electrode potentials [1] ● Ellingham diagrams for reduction of metal oxides using carbon and carbon monoxide as reducing agent [2] ● Electrolytic Reduction, Hydrometallurgy [1] ● Methods of purification of metals: Electrolytic Kroll process, Parting process, van Arkel-de	2

			Boer process and Mond's process, Zone refining [2]	
	Unit II: Acids and Bases	8	● Brönsted-Lowry concept of acid-base reactions, solvated proton [2] ● Relative strength of acids, types of acid-base reactions, levelling solvents [2] ● Lewis acid-base concept, Classification of Lewis acids [2] ● Hard and Soft Acids and Bases (HSAB) Application of HSAB principle [2]	3
	Unit IV: Noble gases	8	● Occurrence and uses, rationalization of inertness of noble gases, Clathrates [2] ● Preparation and properties of XeF_2, XeF_4 and XeF_6 [2] ● Nature of bonding in noble gas compounds (Valence bond treatment and MO treatment for XeF_2) [2] ● Molecular shapes of noble gas compounds (VSEPR theory) [2]	1
MM-302	Inorganic Lab	26	● Inorganic Qualitative analysis	2
MM-503	UNIT –I: Organometallic compounds	12	● Definition, electron count, 18 electron rule, isolobal analogy [2] ● Structure and bonding in some Organometallic compounds (Metal –Olefins compound, metal – ligand sigma-bonded compounds, ferrocene). [3] ● Oxidative addition and reductive elimination reaction. [2] ● Uses of some organometallic compounds in catalysis (Wilkinson's catalyst, Vaska's compound and $HCo(CO)_4$) [3] ● Metal carbonyls: Structure, bonding and IR spectral studies of terminal and bridged carbonyls. [2]	2
	UNIT-III: Error in quantitative analysis	10	● Accuracy, precession, deviation, standard deviation, classification of errors, minimization of errors, significant figures. [5] ● Indicators: Choice of indicators in neutralization, redox, adsorption and complexometric reactions. [5]	2
	UNIT IV: Organic reagents in inorganic analysis	10	● Cupferron, dithizone, benzoin- oxime, 1-nitroso-2- naphthol, diphenyl carbazide, diphenyl carbazone, salicylaldoxime [5] ● 1,10- phenanthroline, magneson, thiourea, zinc uranyl acetate, oxine [5]	1
MM-504	Inorganic Lab.	16	● Volumetric titrations ● Estimation of total hardness of water samples	1

MM-508	Inorganic Lab.	14	● Quantitative analysis	1
NM-501	Unit I: Nuclear Chemistry	6	● Mass defect and binding energy, packing fraction, stability of nucleus, neutron-proton ratio [2] ● Artificial radioactivity, nuclear fission, nuclear reactors, separation of isotopes. [2] ● Detection and measurement of radioactivity by GM counter. Application of radioisotopes in agriculture, medicine and industry. Radiocarbon dating. [2]	2
NM-502	Inorganic Lab.		● Volumetric analysis	

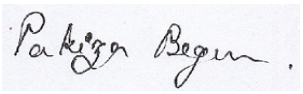
GARGAON COLLEGE
TEACHING PLAN
Course: B. Sc.
Session: Even semester, 2021

Subject: CHEMISTRY
Name of the Teacher: DR. PAKIZA BEGUM
Methods to be applied: Lecture, Group Work, Flipped Classroom, Problem-Based Learning, Experiential Learning, Assessment for Learning, Assignments and Exercises, Group Activities and Discussions, Feedback and Assessments.
Teaching Materials: White Board, Marker, Duster, Laptop, Projector, text books, multimedia, applications, software, digital learning resources including video, audio, text, websites, animations and images, lectures, Online Resources etc.

Paper Code/Title	**Allotted Unit/ Topic**	**No. of Class required**	**Detail of the topics to be taught & class required**	**No. of tutorials**
C-201			NA	
Inorganic Chemistry **C-401**	Unit II: Transition Elements	18	● General group trends with special reference to electronic configuration, colour, variable valency, magnetic and catalytic properties, ability to form complexes. [7] ● Stability of various oxidation states and e.m.f. (Latimer and Bsworth diagrams). [4] ● Difference between the first, second and third transition series. [3]	1

			● Chemistry of Ti, V, Cr, Mn, Fe and Co in various oxidation states (excluding their metallurgy) [4]	
	Unit III: Lanthanoids and Actinoids	6	● Electronic configuration, oxidation states, color, spectral and magnetic properties [3] ● Lanthanide contraction, separation of lanthanides (ion-exchange method only) [3]	3
	Unit IV: Bioinorganic Chemistry	10	● Metal ion present in biological systems, classification of elements according to their action in biological system. Geo chemical effect on distribution of metals. [3] ● Sodium/ K-pump, carbonic anhydrase and carboxypeptidase. [2] ● Excess and deficiency of some trace metals. Toxicity of metal ions (Hg, Pb, Cd and As), reasons for toxicity, use of chelating agents in medicine. [3] ● Iron and its application in bio-systems, Haemoglobin, storage and transfer of iron. [2]	
CHEMISTRY-C-401-LAB	Inorganic Chemistry practical	28	● Gravimetric Analysis [8] ● Inorganic Preparation [8] ● Chromatography of metal ions [8] ● Viva-voce [4]	2
CHEMISTRY-GE-401 (Section A: Inorganic Chemistry **)**	Unit I: Transition Series Elements (3d series)	12	● General group trends with special reference to electronic configuration, variable valency, colour, magnetic and catalytic properties [4] ● Ability to form complexes and stability of various oxidation states (Latimer diagrams) for Mn, Fe and Cu. [4] ● Lanthanoids and actinoids: Electronic configurations, oxidation states, colour, magnetic properties, lanthanide contraction [2] ● Separation of lanthanides (ion exchange method only). [2]	2
	Unit III: Crystal Field Theory	8	● field effect, octahedral symmetry. Crystal field [2] ● Stabilization energy (CFSE), Crystal field effects for weak and strong fields. Tetrahedral symmetry [2] ● Factors affecting the magnitude of D. Spectrochemical series [2] ● Comparison of CFSE for Oh and Td complexes, Tetragonal distortion of octahedral geometry [2]	3

CHEMISTRY-GE-401-LAB	Inorganic Chemistry Practical	20	• Qualitative Inorganic Analysis: Salt analysis [18] • Viva – voce [2]	2
MM-603	UNIT – I: Bio inorganic Chemistry	15	• Metal ion in biological system, role of alkali and alkaline earth metals, iron, copper, cobalt, zinc and molybdenum. [4] • Metalloprotein and metalloenzymes, hemoglobin, myoglobin, plastocyanin, vitamin B_{12}, carbonic anhydrase and nitrogenase. [6] • Metal ion in medicine -- cisplatin and carboplatin. [3] • Use of EDTA in chelation therapy. [2]	1
	UNIT-II: Introduction to material chemistry	10	• Idea about supra molecular interaction. [2] • Solid state reactions. [2] • Nano materials – synthesis and characterization. [3] • C – C composite, polymer and nanocomposite. [1] • Introduction of chemistry of clay (Kaolinite, Montmorillonite and Laponite) [2]	2
	UNIT IV: Industrial chemistry	12	• Industrial water treatment: Demineralized (DM) water and effluent treatment. [2] • Cement and ceramics: Various types of cements, their composition, manufacture [3] • Paints: Constituents, role of binder and solvent, lead and zinc containing paints. [4] • Introduction to Chemical Toxicology: Metal poisoning due to Pb, Cd and Hg, hazard from radioactive fallout [3]	2
MM-604	Inorganic Lab.	18	• Inorganic preparation & Crystallization	1



Signature of Faculty

GARGAON COLLEGE
TEACHING PLAN
Course: B. Sc.
Session: Even semester 2021

Subject: CHEMISTRY

Name of the Teacher: SAHEEN SHEHNAZ BEGUM

Methods to be applied: Lecture, analytical and activity method, interaction and discussion.

Teaching Materials: Green Board, Chalk Pencil, Duster, Book, Journal, Laptop, Projector.

Paper Code/Title	Allotted Unit/ Topic	No. of Cl required	Detail of the topics to be taught & class required	No. of tutorials
Physical Chemistry III MM 601 (Non-CBCS)	UNIT: I Photochemistry	10	● Absorption of light [1] ● Lambert- Beer's law, laws of photochemistry [2] ● Quantum yield, photochemical equilibrium [1] ● Reasons of high and low quantum yield [1] ● Photo-dimerisation - dimerisation of Anthracene [1] ● Photochemical reaction–H_2, Cl_2, H_2-Br_2 [2] ● Dissociation of HI [1] ● Fluorescence, Phosphorescence, Chemiluminescence, Bioluminescence [3] ● Photosensitized reaction [1] ● Photoelectric effect, photoelectric cell [1] ● Introduction to lasers. [1]	4
	Unit: IV Phase Equilibria	10	● Definition of phase components, degree of freedom [1] ● Thermodynamic derivation of phase rule [2] ● Application of phase rule to one component-water and sulphur [1] ● Application of phase rule to two-component systems (solid-liquid equilibrium)-simple eutectic Pb-Ag, KI-H_2O [2] ● Two component-systems with congruent melting point (Zn-Mg) [1]	5

			• Two component system with incongruent melting point (Na_2SO_4-H_2O) interpretation of vapour pressure composition and temperature- composition [2] • Distillation of liquid mixtures [1] • Azeotropic mixture [1] • Clapeyron equation-derivation & application [1] • Clausius-Clapeyron equation-derivation & application. [1]	
NM 101 (Non-CBCS)	Unit: II : Chemical Bonding and Molecular Structure	12	• Ionic Bonding: Energy consideration in ionic bonding [1] • Lattice Energy and Solvation Energy and their importance in the context of Stability and Solubility of ionic compounds [1] • Polarizing power and polarizability. [1] • Fajan's rule, dipole moment and percentage ionic character. [1] • Hydrogen Bonding. [1] • Covalent Bonding: VB Approach-Concept of hybridization, sp, sp^2, sp^3, sp^3d, sp^3d^2 and dsp^2 [1] • VSEPR Theory. [2] • Resonance and Resonance energy [1] • Study of some inorganic and organic compounds (O_3, NO_3^-, CO_3^{2-}, SO_4^{2-} , $RCOO^-$, C_6H_6). [1] • Molecular Orbital Approach: LCAO method [3] • Bonding and antibonding MOs and their characteristics for s-s, s-p and p-p combination of atomic orbitals, non-bonding combination of orbitals [1] • MO treatment of homonuclear diatomic molecules and	5

			hetero-nuclear diatomic molecules such as CO, NO and NO^+ [2]	
CHEMISTRY-C-401 (CBCS)	Unit IV: Bioinorganic Chemistry	10	●Metal ion present in biological systems [1] ●Classification of elements according to their action in biological system [1] ●Geo chemical effect on distribution of metals [1] ●Sodium/K-pump, carbonic anhydrase & carboxypeptidase. [2] ●Excess and deficiency of some trace metals. [2] ●Toxicity of metal ions (Hg, Pb, Cd and As) [1] ●Reasons for toxicity, use of chelating agents in medicine [1] ●Iron & its application in bio-systems [1] ●Haemoglobin, storage and transfer of iron [1]	2

Saheen Shehnaz Begum

Signature of Faculty