Lesson Plan – Honours(Theory) [Session 2019-2020]

Name: Priyabrata Roy

Department: Chemistry

Theory

Semester	Programme	Course and Name of the Paper	Topic	Teacher	No. Of hours
1	Hons	CC – 1	Basics of Organic Chemistry Bonding and Physical Properties	PR	18
			Basics of Organic Chemistry General Treatment of Reaction Mechanism I	PR	02
		CC2	Stereochemistry I	PR	17
			General Treatment of Reaction Mechanism II	PR	03
1	General	CC 1/GE 1	Fundamentalsof Organic Chemistry, Stereochemistry, Nucleophilic Substitution and Elimination Reactions	PR	20
2	Hons	CC-3	StereochemistryII	PR	20
			General Treatment of Reaction Mechanism III	PR	20
			Substitution and Elimination Reactions	PR	20
		CC-4			
2	General	CC/GE 2	Aliphatic Hydrocarbons	PR	10
3	Hons	CC-5			
		CC-6			
		CC-7	Chemistry of alkenes and alkynes	PR	15
			Aromatic Substitution	PR	10
			Carbonyl and Related Compounds	PR	30
			Organometallics	PR	5
		SEC-2	Biochemistry of disease: A diagnostic approach by blood/ urine analysis.	PR	10
3	General	CC/GE 3	Aromatic Hydrocarbons, Organometallic Compounds, Aryl	PR	10

			Halides		
4	Hons	CC-8	Nitrogen compounds	PR	12
			Rearrangements	PR	14
			The Logic of Organic Synthesis	PR	14
			Organic Spectroscopy	PR	20
		CC-9			
		CC-10			
		SEC-3	Drugs & Pharmaceuticals	PR	10
4	General	CC/GE 4	Carboxylic Acids and Their Derivatives, Carbonyl Compounds, Carboxylic Acids and Their Derivatives, Amines and Diazonium Salts, Amino Acids and Carbohydrates	PR	35

Year	Paper	Unit	Topic	No. of lectures	Session
3 Hons	**5**				**July to Pre-Puja**
					post-Puja to Test examination)
	VIA	**CHT 32a Unit I**	<u>Carbanion chemistry and cyclic stereochemistry</u>		**July to Pre-Puja**
			Carbanions	**6**	
			Cyclic Stereochemistry	**1**	
			Conformational analysis	**6**	
		CHT 32a Unit II	<u>Spectroscopy UV, IR, NMR (elementary)</u>		
			UV Spectra	**3**	
			IR Spectra	**3**	
			PMR Spectra	**3**	
		CHT 32b Unit I	<u>Synthetic strategies and Asymmetric synthesis</u>		
			Retrosynthetic analysis	**4**	
			Strategy of ring synthesis	**4**	
			Asymmetric synthesis	**4**	

				Total 34	
		CHT 32b Unit II **CHT 32c Unit I** **CHT 32c Unit II**	Carbohydrate chemistry Monosaccharides Disaccharides Carbocycles and Heterocycles Polynuclear hydrocarbons Heterocyclic compounds Amino acids, peptides and nucleic acids Amino acids Peptides Nucleic acids	**5** **3** **6** **6** **3** **3** **3** **Total 29**	**post-Puja to Test examination)**
	7				**July to Pre-Puja**
					post-Puja to Test examination)
	8				**July to Pre-Puja**
					post-Puja to Test examination)

Lesson Plan – Honours(Practical) [Session 2019-2020]

Name: Priyabrata roy

Department: Chemistry

Practical

Semester	Programme	Course and Name of the Paper	Topic	Teacher	No. Of hours
1	Hons	CC-1-P Organic (1A)	Separation based upon solubility	PR	15
		CC-2-P Organic (1B)	Determination of boiling point	PR	15
2	Hons	CC-3-P	Organic Preparations	PR	45
3	Hons	CC-7-P	Identification of a Pure Organic Compound, Quantitative Estimations	PR	45
4	Hons	CC-8-P	Qualitative Analysis of Single Solid Organic Compounds	PR	45

Year	Paper	Unit	Topic	No. of lectures	Session
3 Hons	**5**				**July to Pre-Puja**
					post-Puja to Test examination)
	6				**July to Pre-Puja**
					post-Puja to Test examination)
	VIIB	**CHP 34b**	Qualitative analysis of single solid organic compounds Organic preparations	**40** **40** **Total 80**	**July to Pre-Puja**
		CHP 34a	<u>Spectroscopic Analysis of Organic Compounds</u> Assignment of labelled peaks in the ^{1}H NMR spectrum of the known organicvcompounds explaining the relative ∂ values and splitting pattern Assignment of labeled peaks in the IR spectrum of the same compound	**20** **20**	**post-Puja to Test examination)**

				Total 40	
	8				**July to Pre-Puja**
					post-Puja to Test examination)

Lesson Plan – General (theory) [Session 2019-2020]

Name: Dr. Priyabrata Roy

Department: Chemistry

Year	Paper	Unit	Topic	No. of lectures	Session
2	**2**				**July to Pre-Puja**
					post-Puja to Winter vacation.
					post-Winter Vacation to Test examination

Year	Paper	Unit	Topic	No. of lectures	Session
3	**IVA**	**CGT 31b Unit II**	Polymers, manufacture, physical properties and uses of natural rubber. Paints, Varnishes and Synthetic Dyes. Drugs and pharmaceuticals. Fermentation Chemicals.	**5** **5** **3** **3** **Total 16**	**July to Pre-Puja**
		CGT 31c Unit II	Fats-Oils-Detergents. Pesticides. Food Additives.	**3** **2** **2** **Total 7**	**post-Puja to Test examination)**

Lesson Plan – General (practical) [Session 2019-2020]

Name: Dr. Priyabrata Roy

Department: Chemistry

Year	Paper	Unit	Topic	No. of lectures	Session
1	**3**	**CGP 23**	Qualitative Analysis of Single Organic Compound(s) Experiment A: Detection of special elements (N, Cl, and S) in organic compounds. Experiment B: Solubility and Classification (solvents: H2O, dil. HCl, dil. NaOH) Experiment C: Detection of functional groups -NO2, -NH2, -COOH, carbonyl (-CHO, >C=O), -OH (phenolic) in solid organic compounds.	**4X3** **3X1** **4X3** **Total 27**	**July to Pre-Puja**

		CGP 23	Experiments A - C with unknown (at least 6) solid samples containing not more than two of the above types of functional groups.	**18(6X3)**	**post-Puja to Winter vacation.**
				18(6X3)	**post-Winter Vacation to Test examination**

Year	**Paper**	**Unit**	**Topic**	**No. of lectures**	**Session**
2	**3**	**CGT 21a**	Qualitative Analysis of Inorganic Mixtures: Experiments A: Preliminary Tests for Acid and Basic radicals in given samples. Experiments B: Wet tests for Acid and Basic radicals in given samples. Experiments C: Confirmatory tests. Acid Radicals: Cl^{-}, Br^{-}, I^{-}, $NO2^{-1}$, S^{2-}, $SO4^{-2}$, $PO4^{-3}$, $BO3^{3-}$, H3BO3. Basic Radicals: Na^{+}, K^{+}, Ca^{+2}, Sr^{+2}, Ba^{+2}, Cr^{+3}, Mn^{+2}, Fe^{+3}, Ni^{+3}, Cu^{+2}, $NH4^{+}$.	**33(11X3)**	**July to Pre-Puja**
		CGT 21a	Analysis of at least 6 unknown samples by each student	**18(6X3)**	**post-Puja to Winter vacation.**
				18(6X3)	**post-Winter Vacation to Test examination**

Lesson Plan – Honours(Theory) [Session 2019-2020]

Name: Ishita Saha

Department: Chemistry

Semester	Programme	Course and Name of the Paper	Topic	Teacher	No. Of hours
1	Hons	CC – 2	Rate Law, order and molecularity	IS	18
			Role of Temperature	IS	02
			Homogeneous catalysis	IS	
1	General	CC 1/GE 1			20
2	General	CC/GE 2			10
3	Hons	CC-5	Chemical Thermodynamics -I	IS	12
			Chemical thermodynamics -II	IS	20
			Chemical Equilibrium	IS	6
	General	CC3/GE3	Ionic Equilibria	IS	8
			Electromotive force	IS	6
4	General	CC4/GE4	Quantum Chemistry and spectroscopy	IS	12

Year	Paper	Unit	Topic	No. of lectures	Session

Year	Paper	Unit	Topic	No. of lectures	Session
3 Hons	**5**				**July to Pre-Puja**
					post-Puja to Test examination)
	VIA	**CHT 33b Unit I**	Unit I. Phase equilibrium and colligative properties Definitions of phase, component and degrees of freedom. Phase rule and its derivations. Definition of phase diagram.	**12** **3**	**July to Pre-Puja**
		CHT 33b Unit II	Unit II. Statistical thermodynamics and the third law	**8**	

			Macrostates and microstates, thermodynamic probability, entropy and probability, Boltzmann distribution formula (with derivation).	**4** **4** **Total 34**	
		CHT 32b Unit II **CHT 32c Unit I** **CHT 32c Unit II**	Unit II. Statistical thermodynamics and the third law Macrostates and microstates, thermodynamic probability, entropy and probability, Boltzmann distribution formula (with derivation). Unit I. Kinetics and photochemistry Collision theory (detailed treatment); outline of Transition State theory. Primary kinetic salt effect. Lindemann theory of unimolecular reaction. Potential energy curves (diatomic molecules), Frank-Condon principle and vibrational structure of electronic spectra. Bond dissociation and principle of determination of dissociation energy (ground state). Decay of excited states by radiative and non-radiative paths. Fluorescence and phosphorescence, Jablonsky diagram.	**5** **3** **6** **6** **3** **3** **3** **Total 29**	**post-Puja to Test examination)**

			Laws of photochemistry: Grotthus-Draper law, Stark-Einstein law		
	7		Unit II. Spectroscopy Rotational spectroscopy of diatomic molecules: rigid rotor model, selection rules, spectrum, characteristic features of spectral lines (spacing and intensity).		**July to Pre-Puja**
			Determination of bond length, effect of isotopic substitution. Vibrational spectroscopy of diatomic molecules: SHO model, selection rules, spectra; anharmonicity and its consequences on energy levels, overtones, hot bands. Raman Effect.		**post-Puja to Test examination)**
	8		Characteristic features and conditions of Raman activity with suitable illustrations. Rotational and vibrational Raman spectra. Rule of mutual exclusion with examples.		**July to Pre-Puja**
					post-Puja to Test examination)

Lesson Plan – Honours(Practical) [Session 2019-2020]

Name: Ishita Saha

Department: Chemistry

Practical

Semester	Programme	Course and Name of the Paper	Topic	Teacher	No. Of hours
1	Hons	CC-2-P	**Experiment 1**: Study of kinetics of decomposition of H_2O_2 **Experiment 2**: Study of kinetics of acid-catalyzed hydrolysis of methyl acetate	IS	20

			Experiment 3: Study of viscosity of unknown liquid (glycerol, sugar) with respect to water. **Experiment 4**: Study of the variation of viscosity with the concentration of the solution **Experiment 5**: Determination of solubility of sparingly soluble salt in water, in electrolyte with common ions and in neutral electrolyte (using common indicator)		
2	General	CC2/GE2 P	**Experiment 1**: Study of kinetics of acid-catalyzed hydrolysis of methyl acetate **Experiment 2**: Study of kinetics of decomposition of H_2O_2 (Clock Reaction) **Experiment 3:** Study of viscosity of unknown liquid (glycerol, sugar) with respect to water. **Experiment 4:** Determination of solubility of sparingly soluble salt in water, in electrolyte with common ions and in neutral electrolyte (using common indicator) **Experiment 5:**Preparation of buffer solutions and find the pH of an unknown buffer solution by colour matching method Experiment 6: Determination of surface tension of a liquid using Stalagmometer	IS	14
3	CC5P		**Experiment 1**: Conductometric titration of an acid (strong, weak/ monobasic, dibasic, and acid mixture) against strong base.		

			Experiment 2: Study of saponification reaction conductometrically **Experiment 3**: Verification of Ostwald's dilution law and determination of K_a of weak acid **Experiment 4:**Potentiometric titration of Mohr's salt solution against standard $K_2Cr_2O_7$ and $KMnO_4$solution **Experiment 5**: Determination of K_{sp} for AgCl by potentiometric titration of $AgNO_3$ solution against standard KCl solution **Experiment 6**: Determination of heat of neutralization of a strong acid by a strong base		

Year	Paper	Unit	Topic	No. of lectures	Session

Year	Paper	Unit	Topic	No. of lectures	Session
3 Hons	**5**		1. Titration of Na_2CO_3 + $NaHCO_3$ mixture vs HCl using phenolphthalein and methyl orange indicators. 2. Titration of HCl + CH_3COOH mixture vs NaOH using two different indicators to find the composition. 3. To find the total hardness of water by EDTA titration.		**July to Pre-Puja**
			4. To find the PH of an unknown solution by comparing color of a series of HCl solutions + 1 drop of methyl orange, and a similar series of NaOH solutions + 1 drop of		**post-Puja to Test examination)**

			phenolphthalein. 5. To determine the rate constant for the acid catalysed hydrolysis of an ester.		
	6		6. Determination of the strength of the H_2O_2 sample. 7. To determine the solubility of a sparingly soluble salt, e.g. KHTa (one bottle)		**July to Pre-Puja**
					post-Puja to Test examination)

Lesson Plan – General (theory) [Session 2018-2019]

Name: Dr. Ishita Saha

Department: Chemistry

Year	Paper	Unit	Topic	No. of lectures	Session
2	**2**	CGT 21	Unit II. Basic physical chemistry II Chemical kinetics and catalysis: order and molecularity of reactions, rate laws and rate equations for first order and second order reactions (differential and integrated forms); zero order reactions.		**July to Pre-Puja**
			Unit I. Basic physical chemistry III Thermodynamics: Definition of thermodynamic terms: Intensive and extensive variables, isolated, closed and open systems. Cyclic, reversible and irreversible processes. Thermodynamic functions and their differentials. Zeroth law of thermodynamics, concept of heat (q) and work (w).		**post-Puja to Winter vacation.**
			First law of thermodynamics,Spontaneous processes, heat engine, Carnot cycle and its efficiency, Second law of thermodynamics,		**post-Winter Vacation to Test examination**

			Chemical equilibrium: chemical equlibria of homogeneous and heterogeneous systems, derivation of expression of equilibrium constants; temperature, pressure and concentration dependence of equilibrium constants (K_P, K_C, K_X); Le Chatelier's principle of dynamic equilibrium.		

Year	Paper	Unit	Topic	No. of lectures	Session
3	**IVA**	**CGT 31b Unit II**		**5** **5** **3** **3** **Total 16**	**July to Pre-Puja**
		CGT 31c Unit II		**3** **2** **2** **Total 7**	**post-Puja to Test examination)**

Lesson Plan – General (practical) [Session 2018-2019]

Name: Dr. Ishita Saha

Department: Chemistry

Year	Paper	Unit	Topic	No. of lectures	Session
1	**3**	**CGP 23**	Qualitative Analysis of Single Organic Compound(s) Experiment A: Detection of special elements (N, Cl, and S) in organic compounds. Experiment B: Solubility and Classification (solvents: H2O, dil. HCl, dil. NaOH)	**4X3** **3X1**	**July to Pre-Puja**

			Experiment C: Detection of functional groups -NO2, -NH2, -COOH, carbonyl (-CHO, >C=O), -OH (phenolic) in solid organic compounds.	**4X3**	
				Total 27	
		CGP 23	Experiments A - C with unknown (at least 6) solid samples containing not more than two of the above types of functional groups.	**18(6X3)**	**post-Puja to Winter vacation.**
				18(6X3)	**post-Winter Vacation to Test examination**

Year	**Paper**	**Unit**	**Topic**	**No. of lectures**	**Session**
2	**3**	**CGT 21a**	Qualitative Analysis of Inorganic Mixtures: Experiments A: Preliminary Tests for Acid and Basic radicals in given samples. Experiments B: Wet tests for Acid and Basic radicals in given samples. Experiments C: Confirmatory tests. Acid Radicals: Cl^-, Br^-, I^-, $NO2^-$ [1], S^{2-}, $SO4^{-2}$, $PO4^{-3}$, $BO3^{3-}$, H3BO3. Basic Radicals: Na^+, K^+, Ca^{+2}, Sr^{+2}, Ba^{+2}, Cr^{+3}, Mn^{+2}, Fe^{+3}, Ni^{+3}, Cu^{+2}, $NH4^+$.	**33(11X3)**	**July to Pre-Puja**
		CGT 21a	Analysis of at least 6 unknown samples by each student	**18(6X3)**	**post-Puja to Winter vacation.**
				18(6X3)	**post-Winter Vacation to Test examination**

PART(1+1+1 2016) REGULATION

Lesson Plan – Honours (theory) **Session 2019-2020**
Name: Dr. Anuva Samanta
Department: Chemistry

Year	Paper	Unit	Topic	No. of lectures
3	**PAPER VIIA**	**CHT 33a Unit I**	Properties of solids, interfaces and dielectrics Crystal, crystal planes, law of rational indices, Calculation of fraction occupied for simple cubic, bcc, and fcc. Miller indices. Bragg's law and its applications for the 16 determination of crystal structure for cubic system single crystal. Crystal structures of NaCl and KCl. Special features of interfaces compared to bulk. Surface dynamics: Physical and chemical adsorption. Freundlich and Langmuir adsorption isotherms; multilayer adsorption and BET isotherm (no derivation required). Gibbs adsorption isotherm and surface excess. Heterogeneous catalysis (single reactant). Colloids: lyophobic and lyophilic sols. Origin of charge and stability of lyophobic colloids. Coagulation and Schultz-Hardy rule. Zeta potential and Stern double layer (qualitative idea). Tyndall effect. Electrokinetic phenomenon (qualitative idea only). Electrical properties of molecules: Polarizability of atoms and molecules, dielectric constant and polarisation, molar polarisation for polar and non-polar molecules. Clausius-Mosotti equation and Debye equation (both with derivation) and their application. Determination of dipole moments.	**30**
		Unit II	Quantum Chemistry – II Simple Harmonic Oscillator: setting up of the Schrodinger stationary equation, energy expression (without derivation), expression of wave function for n = 0 and n = 1 (without derivation) and their characteristic features. Stationary Schrodinger equation for the H-atom in polar coordinates, separation of radial and angular (θ, φ) parts. Solution of φ-part and emergence of quantum number 'm'; energy expression (without derivation), degeneracy. Hydrogenic wave functions up to n = 2 (expression only); real wave function. Concept of orbitals and shapes of s and p orbitals. C	**20**

		CHT 33c Unit II	Spectroscopy Rotational spectroscopy of diatomic molecules: rigid rotor model, selection rules, spectrum, characteristic features of spectral lines (spacing and intensity). Determination of bond length, effect of isotopic substitution. Vibrational spectroscopy of diatomic molecules: SHO model, selection rules, spectra; anharmonicity and its consequences on energy levels, overtones, hot bands. Raman Effect. Characteristic features and conditions of Raman activity with suitable illustrations. Rotational and vibrational Raman spectra. Rule of mutual exclusion with examples.	**20**

Lesson Plan – Honours (practical)
Name: Dr. Anuva Samanta
Department: Chemistry

Year	Paper	Unit	Topic	No. of lectures
3	**VIIB**	CHP 35a	Experiments: 1. Determination of surface tension of a given solution by drop weight method using a stalagmometer, considering aqueous solutions of NaCl, acetic acid, ethanol etc, as systems. 2. Determination of viscosity coefficient of a given solution with Ostwald's viscometer considering aqueous solutions of cane-sugar, glycerol, ethanol, etc. 3. Determination of solubility of sparingly soluble salts in water and various Electrolyte medium by titrimetric method. KHTa as sparingly soluble salt in water, KCl, NaNO3 may be used. 4. Determination of partition coefficient of Iodine or Acetic acid in water and an immiscible organic solvent. 5. Determination of the rate constant for the first order acid catalyzed hydrolysis of an ester (V0 and V∞ be supplied). 6. Determination of rate constant of decomposition of H2O2 by acidified KI solution using clock reactions. A separate laboratory workbook should be maintained for these experiments.	**50**
	VIIIB	CHP 35b	Experiments: 1. To study the kinetics of inversion of sucrose using polarimeter. 2. To study the phase diagram of a binary system (Phenol + water) and the effect of impurities (e.g. NaCl). 3. Determination of ionization constant of a weak acid by conductometric method. 4. To study the kinetics of saponification of ester by conductometric method. 5. Determination of the equilibrium constant of the reaction KI + I2 = KI 3 by partition method (partition coefficient to be supplied).	**80**

			6. Determination of E0 of Fe+3/Fe2 couple in the hydrogen scale by potentiometric titration of ferrous ammonium sulfate solution using KMnO4, or, K2Cr2O7 as standard. 7. Determination of concentration of (i) AgNO3 solution and (ii) solubility product of AgCl by potentiometic titration of standard KCl solution against AgNO3 solution. 8. Determination of pK values of weak monobasic, dibasic and polybasic acid by pHmetric method (e.g. using, acetic acid, succinic acid, oxalic acid, phosphoric acid, etc.). 9. Study of the kinetics of the reaction I- + S2O8 2- by colorimetric method.	

Lesson Plan – General (theory)
Name: Dr. Anuva Samanta
Department: Chemistry

Year	Paper	Unit	Topic	No. of lectures
3	**IVA**	**CGT 31c Unit II**	Industrial chemistry III Fats-Oils-Detergents: Fats and oils, natural fat, edible and inedible oil of vegetable origin. Common fatty acids, glycerides. Hydrogenation of unsaturated oil, production of vanaspati and margarine. Production of toilet and washing soaps, Enzymebased detergents, detergent powder, liquid soaps. Pesticides: Common pesticides: Production, applications and residual toxicity of gammaxane, aldrin, parathion, malathion, DDT, paraquat, decamethrin. Food Additives: Food flavour, food colour, food preservatives, artificial sweeteners, acidulants, alkalies, edible emulsifiers and edible foaming agents, sequesterants – uses and abuses of these substances in food beverages.	**15**
		CGT 31a Unit II	Error analysis and computer applications Accuracy and precision of quantitative analysis, determinate-, indeterminate-, systematic- and random-errors. Methods of least squares and standard deviations. General introduction to computers, different components of a computer, hardware and software, input and output devices, binary numbers and arithmetic. Introduction to computer languages, programming and operating systems.	

Lesson Plan – General (practical)
Name: Dr. Anuva Samanta
Department: Chemistry

Year	Paper	Unit	Topic	No. of

				lectures
3	**IVB**	**CGP 32**	Experiments: 1. Titration of Na2CO3 + NaHCO3 mixture vs HCl using phenolphthalein and methyl orange indicators. 2. Titration of HCl + CH3COOH mixture vs NaOH using two different indicators to find the composition. 3. To find the total hardness of water by EDTA titration. 4. To find the PH of an unknown solution by comparing color of a series of HCl solutions + 1 drop of methyl orange, and a similar series of NaOH solutions + 1 drop of phenolphthalein. 5. To determine the rate constant for the acid catalysed hydrolysis of an ester. 6. Determination of the strength of the H_2O_2 sample. 7. To determine the solubility of a sparingly soluble salt, e.g. KHTa (one bottle)	**3x8**

Semester	Progra -mme	Course and Name of the Paper	Topic	No. Of hours
1	Hons	CC1-2-TH: PHYSICAL CHEMISTRY-1, ORGANIC CHEMISTRY-1B	Kinetic Theory and Gaseous state	20
	Gen	CC1/GE1 TH	Kinetic Theory of Gases and Real gases	7
			Liquids	6
		CC1/GE1 P	1. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture. 2. Estimation of oxalic acid by titrating it with $KMnO_4$. 3. Estimation of water of crystallization in Mohr's salt by titrating with $KMnO_4$. 4. Estimation of Fe (II) ions by titrating it with $K_2Cr_2O_7$ using internal indicator. 5. Estimation of Cu (II) ions iodometrically using $Na_2S_2O_3$. 6.Estimation of Fe(II) and Fe(III) in a given mixture using $K_2Cr_2O_7$ solution.	45
2	Gen	CC/GE 2	Chemical Equilibrium:	7
			Solutions	5
			Phase Equilibria	5
			Solids	5
		CC/GE 2 P	1. Study of kinetics of acid-catalyzed hydrolysis of methyl acetate 2. Study of kinetics of decomposition of H_2O_2 (Clock Reaction) 3. Study of viscosity of unknown liquid (glycerol, sugar) with respect to water. 4. Determination of solubility of sparingly soluble	45

			salt in water, in electrolyte with common ions and in neutral electrolyte (using common indicator) 5. Preparation of buffer solutions and find the pH of an unknown buffer solution by colour matching method 6. Determination of surface tension of a liquid using Stalagmometer	
3	Hon.	CC-3-5-TH	Electrochemistry	24
		SEC(A)-3-2-TH ANALYTICAL CLNICAL BIOCHEMISTRY	Carbohydrates, Proteins, Enzymes	10
	GEN.	CC 3/GE 3 TH	Conductance, Electromotive force	10
		CC 3/GE 3 P	Qualitative semimicro analysis of mixtures containing two inorganic radicals.	45
4	HONS	CC-4-9-TH	Foundation of Quantum Mechanics	25
			Crystal Structure	15
		SEC(B)-4-1-TH	Synthesis of the representative drugs of the following classes: analgesics agents, antipyretic agents, antiinflammatory agents; antibiotics; antibacterial and antifungal agents; antiviral agents, Central Nervous System agents, Cardiovascular, antilaprosy, HIV-AIDS related drugs.	10
	GEN	CC 4/GE 4TH	Quantum Chemistry & Spectroscopy	20
		CC 4/GE 4 P	1.Qualitative Analysis of Single Solid Organic Compound 2. Identification of a pure organic compound	45
		SEC(B)-4-1-TH	Synthesis of the	10

			representative drugs	

Lesson Plan for 2019-20; Teacher: Dr. Soumavo Ghosh, Department of Chemistry

1st year: Semester-1 and semester-2 (Under CBCS): Session 2019-20; Dr. Soumavo Ghosh

Semester	Progra-mme	Course and Name of the Paper	Topic	Session	No. Of lectures
1	Hons	CC1-1-TH: INORGANIC CHEMISTRY-1,	Acid-Base reactions: Thermodynamic acidity parameters, Drago-Wayland equation. Superacids, Gas phase acidity and proton affinity; HSAB principle.Acid-base equilibria in aqueous solution (Proton transfer equilibria in water), pH, buffer. Acid-base neutralisation curves; indicator, choice of indicators.	Jul-Dec	6
			Redox reactions		14
		Total number of hours for CC 1-1 (Theory+Practical) Jul- Dec			20T + 0P
	Gen	CC1/GE1 TH	Chemical Periodicity	Jul-Dec	7
			Acids and bases		3
		CC1/GE1 P	1. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture. 2. Estimation of oxalic acid by titrating it with $KMnO_4$. 3. Estimation of water of crystallization in Mohr's salt by titrating with $KMnO_4$. 4. Estimation of Fe (II) ions by titrating it with $K_2Cr_2O_7$ using internal indicator. 5. Estimation of Cu (II) ions iodometrically using $Na_2S_2O_3$. 6.Estimation of Fe(II) and Fe(III) in a given mixture using $K_2Cr_2O_7$ solution.	Jul-Dec	22.5
		Total number of hours for CC-1/GE-1 (Theory+Practical) Jul- Dec			10T + 22.5P
2	Hons	CC-2-4-TH INORGANIC CHEMISTRY-2	Chemical Bonding-I	Jan-Jun	20
			Radioactivity		10
		Total number of hours for CC 2-4 (Theory+Practical) Jan-Jun			30T + 0P
	Gen	CC/GE 2 TH	Error Analysis and Computer Applications	Jan-Jun	10
			Redox reactions		10
		CC/GE 2 P	1. Study of kinetics of acid-catalyzed hydrolysis of methyl acetate 2. Study of kinetics of decomposition of H_2O_2 (Clock Reaction) 3. Study of viscosity of unknown liquid (glycerol, sugar) with respect to water. 4. Determination of solubility of sparingly soluble salt in water, in electrolyte with	Jan-Jun	22.5

			common ions and in neutral electrolyte (using common indicator) 5. Preparation of buffer solutions and find the pH of an unknown buffer solution by colour matching method 6. Determination of surface tension of a liquid using Stalagmometer		
		Total number of hours for CC-2/GE-2 (Theory+Practical) Jan-Jun			20T + 22.5P

2nd year: Semester-3 and semester-4 (Under CBCS): Session 2019-20; Dr. Soumavo Ghosh

Semester	Progra -mme	Course and Name of the Paper	Topic	Session	No. Of hours
3	HONS	CC-3-6-TH INORGANIC CHEMISTRY-3	Chemical periodicity	Jul-Dec	15
			Chemistry of s and p Block Elements		15
		CC-3-6-P	Complexometric titration, Chromatography of metal ions, Gravimetry		45
		Total number of hours for CC 3-6 (Theory+Practical) Jul- Dec			30T + 45P
	Gen	CC/GE 3 TH	Chemical Bonding : Ionic and covalent bonding	Jul-Dec	10
			Comparative study of p-block elements		5
		Total number of hours for CC-3/GE-3 (Theory+Practical) Jul- Dec			15T + 0P
		SEC(A)-3-1-TH Basic Analytical Chemistry	Introduction to Analytical Chemistry, Chromatography, Ion-exchange, Suggested Applications, Suggested Instrumental demonstrations	Jul- Dec	15
		Total number of hours for SEC(A)-3-1-TH Jul- Dec			15T
4	HONS	CC-4-10-TH INORGANIC CHEMISTRY-4	d-d transitions; L-S coupling; qualitative Orgel diagrams… …charge transfer spectra	Jan- Jun	8
			Chemistry of f- block elements		7
			Inorganic Reaction Kinetics and Mechanism		15
		CC-4-10-P	Inorganic preparations, Instrumental Techniques: 1. Measurement of 10Dq by spectrophotometric method. 2. Determination of λ_{max}		45
		Total number of hours for CC 4-10 (Theory+Practical) Jan- Jun			30T + 45P
	GEN	SEC(B)-4-3-TH	Fermentation	Jan- Jun	10

		PHARMA-CEUTICALS CHEMISTRY			
		Total number of hours for SEC(B)-4-1-TH Jan- Jun			10T

3rd year (Honours) Theory (under 1+1+1 2016 system); Session 2019-20; Dr. Soumavo Ghosh

Year	Paper	Unit	Topic	No. of lectures	Session
3	**V**	**CHT 31b Unit I**	18-electron rule and its applications to carbonyls (including carbonyl hydrides and carbonylates), nitrosyls, cyanides, and nature of bonding involved therein. Simple examples of metal-metal bonded compounds and metal clusters. Metal-olefin complexes: Zeises salt (preparation, structure and bonding), Ferrocene (preparation, structure and reactions). Hapticity(η) of organometallic ligands, examples of mono tri and penta-hapto cyclopentadienyl complexes. Simple examplesof fluxional molecules. Coordinative unsaturation: oxidative addition and insertionreactions. Homogeneous catalysis by organometallic compounds: hydrogenation, hydroformylation and polymerization of alkenes (Ziegler-Natta catalysis).	**5** **5** **5**	**July to Pre-puja**
		CHT 31b Unit II	Elements of life: essential major, trace and ultratrace elements. Basic chemical reactions in the biological systems and the role of metal ions (specially Na^+, K^+, Mg^{2+}, Ca^{2+}, $Fe^{3+/2+}$, $Cu^{2+/+}$ and Zn^{2+}). Metal ion transport across biological membrane: Na^+-ionpump, ionophores. Biological functions of hemoglobin and myoglobin, cytochromes and ferredoxins, carbonate bicarbonate bufferingsystem and carbonic anhydrase. Biological nitrogen fixation, Photosynthesis: Photosystem-I and Photosystem-II.	**3** **6** **Total 24**	
			Toxic metal ions and their effects, chelation therapy (examples only), Pt and Au complexes as drugs (examplesonly), metal dependent diseases.	**2**	**Post Puja to Winter vacation**
		CHT 31c Unit I	Electrochemical methods: Conductometry, Potentiometry, pH-metry. Electrogravimetry,	**3**	

			Coulometry. Spectrophotometry: Lambert-Beer law, Limits to Beer'slaw, Principle of spectrophotometric estimation of iron, manganese and phosphorous. Principles and instrumentations of atomic absorption andatomic emission spectrometry; estimation of sodium and potassium in water samples. Ion exchange resins and their exchange capacities, principle and simple applications of ionexchange separation. Chromatographic separations: General description and classification of chromatographic methods, thin layer, paperand column chromatographic techniques and their simple applications, Rf-values and their significance, elution in column chromatography, migration rates of solutes, band broadening and column efficiency, column resolution.	**2** **3** **5** **Total 15**	
		CHT 31c Unit II	Errors in chemical analysis: Accuracy and precision of measurements, determinate indeterminate, systematic and random errors in chemical analysis with examples, absolute and relative errors; source, effect and detection of systematicerrors; distribution of random errors, normal error curve, standard deviations, standard deviation of calculated results-sum or difference, product or quotient, significant figures, rounding and expressing results of chemical computations. Principles for determination of BOD, COD, DO, TDS, in water samples. Detection and estimation of As, Hg, Cd, Pb, NH^{4+}, and F^{-}, NO^{3-}, NO^{2-} in water sample. Detection, collection and principles of estimation of CO, NOx, SO_2, H_2S and SPMin air samples.	**8** **7** **Total 15**	**post-Winter vacation to Test exam-ination**

3rd year (Honours) Practical (under 1+1+1 2016 system); Session 2019-20; Dr. Soumavo Ghosh

Year	Paper	Unit	Topic	No. of lectures	Session
3	-	-		**0**	**July to Pre-puja**
		-		**0**	**post-Puja to Test examination**

3rd year (General) Theory (under 1+1+1 2016 system); Session 2019-20; Dr. Soumavo Ghosh

Year	Paper	Unit	Topic	No. of lectures	Session
3	**IVA**	**CGT 31a Unit I**	Gravimetric Analysis: Solubility product and commonion effect. Requirements of gravimetry. Gravimetric estimation of chloride, sulphate, lead, barium, nickel, copper and zinc. Volumetric Analysis: Primary and secondary standardsubstances, principles of acid-base, oxidation – reduction, and complexometric titrations; acid-base, redox and metal-ion indicators. Principles of estimation of mixtures of $NaHCO_3$ and Na_2CO_3(by acidimetry); iron, copper, manganese, chromium (by redox titration); zinc, aluminum, calcium,magnesium (by complexometric EDTA titration).	**5** **5** **3** **Total 16**	**July to Pre-puja**
			Chromatographic methods of analysis: columnchromatography and thin layer chromatography.	**3**	**post-Puja to Winter vacation**
		CGT 31a Unit II	Accuracy and precision of quantitative analysis, determinate-, indeterminate-, systematic- and random-errors. Methods of least squares and standard deviations.	**3** **2** **Total 8**	
			General introduction to computers, different components of a computer, hardware and software, input and output devices, binary numbers and arithmetic. Introduction to computer languages, programming and operating systems.	**6** **Total 6**	**post-Winter vacation to Test exam-ination**

3rd year (General) Practical (under 1+1+1 2016 system); Session 2019-20; Dr. Soumavo Ghosh

Year	Paper	Unit	Topic	No. oflectures	Session
3	-	-	-	**0**	**July to Pre-puja**
		-	-	**0**	**post-Puja to Wintervacation**
		-	-	**0**	**post-Wintervacation to Test examination**

Lesson Plan: Department of Chemistry 2019-2020
Dr. Sharmila Bhattacharya

Semester/B. Sc. (1 +1+1)	Programme	Course and Name of the Paper	Topic	No. Of hours
Sem-1	Hons	CC1-1-TH: INORGANIC CHEMISTRY -1	**Extra nuclear Structure of atom** **Acid-Base reactions**	**14** **6**
		CC1-1-P	**INORGANIC CHEMISTRY: I (1) LAB: Acid and Base Titrations and Oxidation-Reduction Titrations**	**30**
	Gen		Total number of hours for CC1-1 (Theory+Practical)	20T + 30P
		CC1/GE1 TH	Atomic Structure Acids and bases	7 3
			Total number of hours for CC1-GE1 (Theory+Practical)	10
Sem-2	Hons		**Chemical Bonding-II**	**30**
		CC-2-4-P	**Iodo-/ Iodimetric Titrations, Estimation of metal content in some selective samples**	**45**
			Total number of hours for CC 2-4 (Theory+Practical)	30T + 45P
Sem-3	Hons	CC-3-6-TH	Noble Gases, Inorganic Polymers Coordination Chemistry-I	15 15
			Total number of hours for CC-3-6-TH	30
		SEC(A)-3-2-TH ANALYTICAL CLINICAL BIOCHEMISTRY	Lipids, Lipoproteins	10
	Gen	CC/GE 3 TH	Chemical Bonding : MO Approach Transition Elements (3d series and Lanthanoids and actinoid) Coordination Chemistry	5 5 5
		CC 3/GE 3 P	Qualitative semimicro analysis of mixtures containing two inorganic radicals	12
			Total number of hours for CC/GE 3 (Theory+Practical)	15T + 12P
Sem-4	Hons	CC-4-10-TH	Coordination Chemistry-II Chemistry of d-block elements	22 8
			Total number of hours for CC-4-10-TH	30
		SEC(B)-4-1-	Fermentation	10

		TH PHARMA-CEUTICALS CHEMISTRY		
	Gen	CC 4/GE 4 TH	Crystal Field Theory	20
		CC 4/GE 4 P	1.Qualitative Analysis of Single Solid Organic Compound 2.Identification of a pure organic compound	12
			Total number of hours for CC4/GE4 (Theory+Practical)	20T+12P

Year	Paper	Unit	Topic	No. of lectures	Session
3 Hons	**V CHT 31a**	**I**	**Chemistry of coordination compounds**	**20**	**July to pre-puja**
		II	**Chemistry of d- and f-block elements**	**4**	
	CHT 31d	**I**	**Gravimetric and titrimetric method of analysis**		**Post-puja to Text Examination**
		II	**Thermodynamics of dissolution**	**8**	
2 Hons	**IVA CHT 21a**	**II**	**Other types of bonding**	**4**	**July to pre-puja**
	CHT 21b	**I**	**Other types of bonding and Chemistry of s and p block elements**		**Post-puja to Winter recess**
			Chemistry of s and p block elements		**Post winter recess to Test Examination**
	IVB CHP 24a	**I**	**(i) Iodometric/Iodimetry: Vitamine C**	**4** **8**	**July to pre-puja**
			(ii) Permanganometry: Fe^{3+} and Mn^{2+} in a mixture		
			(iii) Dichromatometry: Fe^{3+} and		**Post puja to winter recess**

			Cu^{2+} in a mixture; Fe^{3+} and Cr^{6+} in a mixture **(iv) Complexometry (EDTA): $CaCO_3$ and $MgCO_3$ in a mixture; Mg^{2+} and Zn^{2+} in a mixture**	**16**	**Post winter recess to Test Examination**
3 Gen	**IVA CGT 31c** **CGP 32**	**I**	**Environmental chemistry** **Environmental chemistry** **(i) Estmation of Na_2CO_3 and $NaHCO_3$ in a mixture** **(ii) Estmation of HCl and CH_3COOH in a mixture** **(iii) Determination of total hardness of water by EDTA titration** **(iv) To find the pH of an unknown solution by comparing colour** **(v) Determination of rate constant for the acid catalysed hydrolysis of an ester** **(vi) Determination of strength of H_2O_2 sample** **(vii) Determination of solubility of a sparingly**		**July to pre-puja** **Post-puja to Test Examination** **July to Test Examination**

			soluble salt		
2 Gen	**CGT 21b**	**I**	**Principles of qualitative inorganic analysis**	**4**	**July to pre-puja**
		II	**Basic inorganic chemistry**	**4**	**Post-puja to winter recess**
	CGP 24	**III**	**Qualitative analysis of inorganic mixture**	**60**	**July to Test Examination**