COURSE PLANER
Department of Chemistry
Basirhat College
Session: 2018-19
CEMA III-Year (1+1+1 Systems)

Paper V/ Paper Code: CEMAT 35-IA, 35-IB, 35-AA, 35-AB/ Total Marks: 100
Course coordinator: Dr. Swastik Karmakar
CO1: Student will learn about Coordination chemistry and its applications.
CO2: The course provides ideas about the d, f block elements and bioinorganic chemistry.
CO3: Students will learn about different organo metallic chemistry.

Course planner

SL	Course Topic	Teacher	Class No	Remarks
Jul-	CEMAT 35-IA Unit I. Chemistry of coordination compounds Isomerism, reactivity and stability: Determination of configuration of cis- and trans- isomers by chemical methods. Labile and inert complexes (application of CFAE), substitution reaction on square planer complexes.	SM	2	
	CEMAT 35-IA Unit II. Chemistry of d- and f- block elements General comparison of 3d, 4d and 5d elements in term of electronic configuration, elemental forms, metallic nature, atomization energy.	BD	2	
	CEMAT 35-IB Unit I. Organometallic Compounds 18-electron rule and its applications to carbonyls (including carbonyl hydrides and carbonylates).	MS	2	
	CEMAT 35-IB Unit II: Gravimetric and tritimetric methods of analysis Requirements of gravimetry: properties of precipitates and precipitating regents, particle size and filterability of precipitates.	SG	1	
	CEMAT 35-AA Unit I. Bioinorganic Chemistry Elements of life: essential major, trace and ultratrace elements.	SK	1	
Aug	CEMAT 35-IA Unit I. Chemistry of coordination compounds Trans effect (example and applications). Stability constants of coordination compounds and their importance in inorganic analysis. Structure and bonding: EAN rule, VB description and its limitations. Elementary Crystal Field Theory: splitting of d^n configurations in octahedral, square planar and tetrahedral fields, crystal field stabilization energy in weak and strong fields.	SM	4	
	CEMAT 35-IA Unit II. Chemistry of d- and f- block elements General comparison of 3d, 4d and 5d elements in term of oxidation states, redox properties, coordination chemistry, spectral and magnetic properties.	BD	4	
	CEMAT 35-IB Unit I. Organometallic Compounds nitrosyls, cyanides, and nature of bonding involved therein. Simple examples of metal-metal bonded compounds and metal clusters.	MS	4	
	CEMAT 35-IB Unit II: Gravimetric and tritimetric methods of analysis Colloidal and crystalline precipitates coprecipitation and post-precipitation drying and ignition of precipitates, principles of	SG	4	

	gravimetric estimation of chloride, phosphate, zinc, iron, aluminum and magnesium singly.			
	CEMAT 35-AA Unit I. Bioinorganic Chemistry 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+}).	SK	4	
Sept	CEMAT 35-IA Unit I. Chemistry of coordination compounds Pairing energy, evidence and application of crystal field (lattice energy, ionic radius, hydration energy, redox pot, spinel), Jahn-Teller distortion(static and dynamic),evidence from stability constant and vis-spectra. Metal-ligand bonding (MO concept, elementary idea), sigma- and pi-bonding in octahedral complexes (qualitative pictorial approach) and their effects on the oxidation states of transitional metals (examples).	SM	4	
	CEMAT 35-IA Unit II. Chemistry of d- and f- block elements f-block elements: electronic configuration, ionization energies, oxidation states, variation in atomic and ionic (3+) radii, magnetic and spectral properties of lanthanides,	BD	4	
	CEMAT 35-IB Unit I. Organometallic Compounds Metal-olefin complexes: zeises salt (preparation, structure and bonding), Ferrocene (preparation, structure and reactions). Hapticity(n) of organometallic ligands,	MS	4	
	CEMAT 35-IB Unit II: Gravimetric and tritimetric methods of analysis Primary and secondary standard substances in acid-base, redox, complexometric (EDTA) and argentometric titrations. Principle and application of redox tritimetric estimation based on the use of the following reagents: $KMnO_4$, $K_2Cr_2O_7$, I_2, $Na_2S_2O_3.5H_2O$, $KH(IO_3)_2$and $KBrO_3$. Principle of argentimetric estimation of chloride using adsorption indicators.	SG	4	
	CEMAT 35-AA Unit I. Bioinorganic Chemistry Metal ion transport across biological membrane Na^+-ion pump, ionophores. Biological functions of hemoglobin and myoglobin,	SK	2	
Nov	CEMAT 35-IA Unit I. Chemistry of coordination compounds Magnetism and Colour: Orbital and spin magnetic moments, spin only moments of d^n ions and their correlation with effective magnetic moments, including orbital contribution; quenching of magnetic moment: super exchange and antiferromagnetic interactions (elementary idea with examples only); d-d transitions.	SM	4	
	CEMAT 35-IA Unit II. Chemistry of d- and f- block elements comparison between lanthanide and actinides, separation of lanthanides (by ion-exchange method).Chemistry of some representative compounds: $K_2Cr_2O_7$, $KMnO_4$, $K_4[Fe(CN)_6]$,	BD	4	
	CEMAT 35-IB Unit I. Organometallic Compounds Examples of mono tri and penta-haptocyclopentadienyl complexes. Simple examples of fluxional molecules. Coordinative unsaturation: oxidative addition and insertion reactions.	MS	4	
	CEMAT 35-IB Unit II: Gravimetric and tritimetric methods of analysis Principle of complexometric EDTA titration, metal ion indicators (examples), masking and demasking reactions, estimation of Cu-Zn, Fe-Al and Ca-Mg mixture by EDTA titration methods.	SG	4	

	CEMAT 35-AA Unit I. Bioinorganic Chemistry Cytochromes and ferredoxins, carbonate bicarbonate buffering system and carbonicanhydrase. Biological nitrogen fixation, Photosynthesis: Photosystem-I and Photosystem-II.	SK	4	
Dec	CEMAT 35-IA Unit I. Chemistry of coordination compounds L-S coupling, Hole formalism principle; qualitative Orgel diagrams for $3d^1$-$3d^9$ ions and their spectroscopic ground states; selection rules for electronic spectral transitions; spectrochemical series of ligands; Nephelauxetic parameter charge transfer spectra, different types (elementary idea with examples).	SM	4	
	CEMAT 35-IA Unit II. Chemistry of d- and f- block elements Chemistry of some representative compounds:$K_2[Ni(CN)_4]$, H_2PtCl_6, $Na_2[Fe(CN)_5NO]$. CEMAT 35-AA Unit II. Material Chemistry Silicate minerals (Quartz)Zeolite: structure, accommodation of 'guest ions'.	BD	2+2	
	CEMAT 35-IB Unit I. Organometallic Compounds Homogeneous catalysis by organometallic compounds: hydrogenation, hydroformylation and polymerization of alkenes (Ziegler-Natta catalysis).	MS	4	
	CEMAT 35-IB Unit II: Gravimetric and tritimetric methods of analysis Dissolution, scheme of analysis and principles of estimation of the constituents of the following materials: dolomite, pyrolusite, chalchopyrites, Portland cement, basic slag, brass, steel and type metal. CEMAT 35-AB Unit I : Bioorganic Chemistry Secondary, tertiary and quaternary structure of proteins,	SG	2+2	
	CEMAT 35-AA Unit I. Bioinorganic Chemistry Toxic metal ions and their effects, chelation therapy (examples only), Pt and Au complexes as drugs (examples only), metal dependent diseases.	SK	4	
Jan	CEMAT 35-AA Unit II. Material Chemistry Nanomaterials: (Definition and properties).Carbon nano particles (BuckmisterFullerence C_{60}), Gold nano particles	BD	4	
	CEMAT 35-AB Unit I : Bioorganic Chemistry Classification of enzymes and co-enzymes (simple examples), nucleic acids: structure of nucleosides and nucleotides, DNA, RNA, complementary base pairings, elementary idea of double helical structure of DNA [Watson-Crick model, Houg-Steen model (for adenine only)], naturation and denaturation of protein.	MS SK SG SM	16	
Feb	CEMAT 35-AA Unit II. Material Chemistry Metal clusture structure i) carbonyl ii) oxide, Metal surface catalysis (NH_3 products, Haber process).	BD	4	
	CEMAT 35-AA Unit II. Material Chemistry Polymer: definition, classification, different types of molecular weight.	SM	4	
	CEMAT 35-AB Unit-II : Biophysical Chemistry	MS SK SG	12	

	Colloids and their stability, elementary idea of electrical double layer and its protective role in the stability of colloids, isoelectric point, Autocatalysis, Enzyme catalysis, Michaelis-Menten equation, Lineweaver-Burk plot, turnover number and catalytic efficiency of enzymes, Mechanisms of enzyme inhibition, pH-dependence of enzyme activity, Electrophoresis, elementary idea of gel electrophoresis,			
Mar	CEMAT 35-AA Unit II. Material Chemistry/2 Molecular weight determination (viscosity average and weight average method).	SM	4	
	CEMAT 35-AB Unit-II : Biophysical Chemistry polyacrylamide gel electrophoresis (PAGE) and SDS-PAGE, Isoelectric focusing.	BD/ SG/ SK/ MS	4	
Apr-				
	Total:		134	

Resources:

Books:

1. Lee, J. D. *Concise Inorganic Chemistry*,5th Ed., Wiley India Pvt. Ltd.,2008.
2. Douglas,B.E.andMcDaniel,D.H.*Concepts&ModelsofInorganicChemistry* Oxford, 1970.
3. Day, M.C. and Selbin, J. *Theoretical Inorganic Chemistry*, ACS Publications, 1962.
4. Atkin, P. *Shriver & Atkins' Inorganic Chemistry,* 5th Ed., Oxford University Press (2010).
5. Cotton,F.A.,Wilkinson,G.andGaus,P.L.,*BasicInorganicChemistry3rdEd.;*Wiley India
6. Sharpe, A.G., *Inorganic Chemistry*, 4th Indian Reprint (Pearson Education)2005.
7. Huheey, J. E.; Keiter, E.A. &Keiter, R.L. *Inorganic Chemistry, Principles.*
8. Lippard, S.J. & Berg, J.M. *Principles of Bioinorganic Chemistry* Panima Publishing Company1994.
9. Huheey, J. E.; Keiter, E.A. &Keiter, R.L. *Inorganic Chemistry, Principles ofStructure and Reactivity 4th Ed.*, Harper Collins 1993,Pearson,2006.
10. Greenwood, N.N.&Earnshaw A. *Chemistry of the Elements*, ButterworthHeinemann,1997.

1. Other resources :

*Remarks will specify

- The nature of the class-topic (viz. Theoretical, Practical, and Tutorial).
- Methodology of teaching (whether using ICT, engaging students in group discussion, quiz etc. etc.)
- Different modes of assessment. (Please check UGC evaluation reforms)

COURSE PLANER
Department of Chemistry
Basirhat College
Session: 2018-19
CEMA III-Year

Paper VI/ Paper Code: CEMAT 36-OA, 36-OB, 36-PA, 36-PB/ Total Marks: 100
Course coordinator: Prof. Monojit Sarkar
CO1: This course is about organic synthesis.
CO2: Students can enrich their knowledge about solution and it's different properties.
CO:3 Molecular spectra can be learnt from this course.

Course planner

SL	Course Topic	Teacher	Class hour	Remarks
Jul-	CEMAT 36-OA UNIT I Organic synthesis : Disconnection approach towards synthesis of bifunctional molecules (both cyclic and acyclic) :	SK	1	
	CEMAT 36-OA UNIT II Heterocyclic compounds: Synthesis (including retrosynthetic approach).	MS	1	
	CEMAT 36PB Unit-II : Phase equilibria and colligative properties Phase equilibrium and colligative properties.	BD	1	
	CEMAT 36-PA 17 Unit-I: Statistical Thermodynamics and Third Law Macrostates and microstates, thermodynamic probability.	SG	1	
	CEMAT 36PB 17 Unit-I : Properties of Solid, interface and dielectrics Crystal, crystal planes, law of rational indices.	SM	1	
Aug	CEMAT 36-OA UNIT I Concept of synthons, synthetic equivalents (ethyl acetoacetate, ethyl cyanoacetate and diethyl malonate as examples), functional group interconversion (FGI), protection and deprotection of common functional groups (-OH, -carbonyl, -NH_2, -COOH) in synthetic route.	SK	4	
	CEMAT 36-OA UNIT II reactivity, orientation and important reactions of furan, pyrrole, thiophene, pyridine, indole, quinoline and isoquinoline,	MS	5	
	CEMAT 36PB Unit-II : Phase equilibria and colligative properties Definitions of phase, component and degrees of freedom. Phase rule and its derivations. Definition of phase diagram. Phase equilibria for one component system – water, CO2. First order phase transition and Clapeyron equation; Use of Clausius-Clapeyron equation.	BD	5	
	CEMAT 36-PA Unit-I: Statistical Thermodynamics and Third Law Entropy and probability, Boltzmann distribution formula (with derivation). Applications to barometric distribution.	SG	4	
	CEMAT 36PB 17 Unit-I : Properties of Solid, interface and dielectrics Calculation of fraction occupied for simple cubic, bcc, and fcc. Miller indices. Bragg's law and its applications for the determination of crystal structure for cubic system single crystal. Crystal structures of NaCl and KCl. Brief idea about liquid crystals.	SM	4	
Sept	CEMAT 36-OA	SK	4	

	UNIT I Activation of synthetic equivalents, umpulong, illogical electrophiles and nucleophiles, disconnection and synthesis of 1,3-, 1,4, 1,5 and 1,6-dioxygenated compounds, Robinson ring annulation, Favorskii rearrangement, large ring compound synthesis (High dilution principle)			
	CEMAT 36-OA UNIT II Knorr pyrrole synthesis, Hantzsch pyridine synthesis, Fischer indole synthesis and Bischler-Napieralsky synthesis.	MS	5	
	CEMAT 36PB Unit-II : Phase equilibria and colligative properties Liquid vapour equilibrium for two component systems. Ideal solution at fixed temperature and pressure. Principle of fractional distillation. Duhem-Margules equation. Henry's law. Konowaloff's rule. Positive and negative deviations from ideal behaviour. Azeotropic solution. Liquid-liquid phase diagram using phenol-water system. Solid- liquid phase diagram. Eutectic mixture. Nernst distribution law. Solvent extraction.	BD	5	
	CEMAT 36-PA Unit-I: Statistical Thermodynamics and Third Law Partition function. Derivation of expression of thermodynamic functions using partition function.	SG	4	
	CEMAT 36PB 17 Unit-I : Properties of Solid, interface and dielectrics 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).	SM	4	
Nov	CEMAT 36-OA UNIT I Stereoselective synthesis (Cram's rule, Prelog's rule). Pericyclic reactions : Definition and classification, Electrocyclic reactions : FMO approach, examples of electrocyclic reactions (thermal and photochemical) involving 4- and 6π- electrons and corresponding cycloreversion reactions,	SK	2+2	
	CEMAT 36-OA UNIT II Pharmaceuticals: Preparation and uses of sulphadiazine, chloroquine, metronidazole, chlorpromazine, indomethacin, ranitidine.	MS	5	
	CEMAT 36PB Unit-II : Phase equilibria and colligative properties ΔG, ΔS, ΔH and ΔV of mixing for binary solutions. Vapour pressure of solution. Ideal solutions, ideally diluted solutions and colligative properties. Raoult's law. Thermodynamic derivation of colligative properties of solution (using chemical potential) and their inter-relationships. Abnormal colligative properties.	BD	5	
	CEMAT 36-PA Unit-I: Statistical Thermodynamics and Third Law Dulong-Petit's law and Einstein's theory of heat capacity of solids. Limitation of Einstein's theory and Debye's modification (qualitative).	SG	4	
	CEMAT 36PB 17 Unit-I : Properties of Solid, interface and dielectrics Electrical properties of molecules: Polarizability of atoms and molecules, dielectric constant and polarisation, molar polarisation for polar and non-polar molecules.	SM	4	
Dec	CEMAT 36-OA UNIT I Cycloaddition reactions: FMO approach, Diels-Alder Reaction, photochemical [2+2] reactions, Sigmatropic shifts and their order, [1,3] and [1,5] H shifts, [3,3] shifts with references to Claisen and Cope rearrangements, ene reaction (simple treatment)	SK	4	

	Polynuclear hydrocarbons: Nomenclature, synthesis and important reactions of naphthalene, anthracene and phenanthrene.			
	CEMAT 36-OB UNIT II Amino acids, peptides and proteins: synthesis of α - amino acids [Gabriel, Strecker, azlactone, hydantoin, acetamidomalonic ester methodologies], isoelectric point, ninhydrin reaction.	MS	5	
	CEMAT 36-PA Unit-II : Molecular 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.	BD	5	
	CEMAT 36-PA Unit-I: Statistical Thermodynamics and Third Law Nernst heat theorem. Approach towards zero kelvin, adiabatic demagnetisation. Planck's formulation of third law and absolute entropies.	SG	4	
	CEMAT 36PB 17 Unit-I : Properties of Solid, interface and dielectrics Clausius-Mosotti equation and Debye equation (both without derivation) and their application. Determination of dipole moments.	SM	4	
Jan	CEMAT 36-OB UNIT I Streochemistry of cyclohexanes, mono- and disubstituted, Baeyer strain theory, Concept of I-strain, conformational analysis of cyclohexanes, energy profile of ring inversion of cyclohexane, symmetry properties of chair, boat and skew boat conformations. Conformational analysis of mono and di-substituted cyclohexanes, Dynamic stereochemistry: E_2, SN_2 and NGP, lactonisation reactions of cyclohexane systems.	SK	4	
	CEMAT 36-OB UNIT II Peptides: geometry of peptide linkage, peptide synthesis including Merrifield ptotocol, C - terminal and N- terminal determination, determination of amino acid sequence, proteins: classification , structure (primary only).	MS	5	
	CEMAT 36-PA Unit-II : Molecular Spectroscopy Vibrational spectroscopy of diatomic molecules: SHO model, selection rules, spectra; anharmonicity and its consequences on energy levels, overtones, hot bands.	BD	5	
	CEMAT 36-OB UNIT I Oxidation of cyclohexanols with chromic acid, pinacol-pinacolone rearrangements, esterification, saponification of ester, steric assistance and steric hindrance there in, cyclohexene and cylohexanone: stereochemistry, bromine addition and epoxydation of cyclohexene, nucleophilic addition to cyclohexanone.	SG	4	
	CEMAT 36-OB UNIT I Carbohydrates: monosaccharides: classification of monosaccharides, osazone formation, stepping up and stepping down of aldoses, interconversion of aldose and ketose, epimerization.	SM	4	
Feb	CEMAT 36-OB UNIT I Constitution and configuration of D- glucose and D- fructose, ring structure and conformational aspects of D- glucose and its derivatives, anomeric effect, mutarotation of D- glucose, Disaccharides : Structure of sucrose only.	SK	4	
	CEMAT 36-OB UNIT II	MS	5	

	Natural products: Terpenoids : Classification, isoprene rule, structure and synthesis of citral, geraniol and nerol. Alkaloids: Structure and synthesis of ephedrine and nicotine.			
	CEMAT 36-PA <u>Unit-II : Molecular Spectroscopy</u> Raman Effect. Characteristic features and conditions of Raman activity with suitable illustrations. Rotational and vibrational Raman spectra. Rule of mutual exclusion with examples.	BD	5	
		TOTAL	129	

Resources:

Books

1. Atkins, P. W. & Paula, J. de *Atkins' Physical Chemistry*, Oxford UniversityPress.
2. Castellan, G. W. *Physical Chemistry*, Narosa
3. McQuarrie, D. A. & Simons, J. D. *Physical Chemistry: A Molecular Approach*, VivaPress.
4. Engel, T. & Reid, P. *Physical Chemistry*, Pearson
5. Levine, I. N. *Physical Chemistry*, TataMcGraw-Hill
6. Maron, S. &Prutton*PhysicalChemistry*
7. Ball, D. W. *Physical Chemistry*, ThomsonPress
8. Mortimer, R. G. *Physical Chemistry*,Elsevier
9. Fleming, I. *Pericyclic Reactions*, Oxford Chemistry Primer, Oxford University Press.
10. Gilchrist, T. L. &Storr, R. C. *Organic Reactions and Orbital symmetry*, Cambridge UniversityPress.
11. Finar, I. L. *Organic Chemistry (Volume 1)*, Dorling Kindersley (India) Pvt. Ltd.(PearsonEducation).
12. Finar, I. L. *Organic Chemistry* (*Volume 2: Stereochemistry and the Chemistry of Natural Products*), Dorling Kindersley (India) Pvt. Ltd. (PearsonEducation).

Other resources :

*Remarks will specify

- The nature of the class-topic (viz. Theoretical, Practical, and Tutorial).
- Methodology of teaching (whether using ICT, engaging students in group discussion, quiz etc. etc.)
- Different modes of assessment. (Please check UGC evaluation reforms).

COURSE PLANER
Department of Chemistry
Basirhat College
Session: 2018-19
CEMA III-Year

Paper VII/ Paper Code: CEMAP 37-Pr/ Total Marks: 75(PRACTICAL)+25(LNB+VIVA)
Course coordinator: Dr.Bidyut Debnath
CO1: Students can get fundamental ideas about various experiments like TLC, Redox Titration, Conductometric titration etc.
CO2: Those experiments which are very essential for future research.
Course planner

SL	Course Topic	Teacher	Class hour	Remarks
Jul-	Identification of amino acids by TLC/paper.	SK	2	
	To study the kinetics of inversion of sucrose using polarimeter.	MS	2	
	Determination of ionization constant of a weak acid by conductometric method.	SG	2	
Aug	Identification of amino acids by TLC/paper. Binary mixture separation (neutral + acid or base) and identification by TLC/Paper.	SK	8	
	To study the kinetics of inversion of sucrose using polarimeter. To study the phase diagram of a binary system (Phenol + water) and the effect of impurities (e.g. NaCl).	MS	8	
	Determination of ionization constant of a weak acid by conductometric method. To study the kinetics of saponification of ester by conductometric method.	SG	8	
Sept	Binary mixture separation (neutral + acid or base) and identification by TLC/Paper.	SK	8	
	Determination of formal potential of Fe^{+3}/Fe^{+2} couple in the hydrogen scale by potentiometric titration of ferrous ammonium sulfate solution using $KMnO_4$, or, $K_2Cr_2O_7$ as standard.	MS	8	
	Conductometric titration of HClvsNaOH, AcOHvsNaOH.	SG	8	
Nov	Determination of pK values of weak monobasic, dibasic and polybasic acid by pH-metric method (e.g. using, acetic acid, succinic acid, oxalic acid, phosphoric acid, etc.).	MS	8	
	Determination of concentration of (i) $AgNO_3$ solution and (ii) solubility product of AgCl by potentiometic titration of standard KCl solution against $AgNO_3$ solution.	SG	8	
Dec	Study of the kinetics of the reaction $I^- + S_2O_8^{-2}$ by colorimetric method. Determination of $\wedge o$ of a strong electrolyte (KCl) conductometrically.	MS	8	
	Repeat as per students	SG	4	
Jan	Determination of specific rotation of an optically active substance. Determination of indicator constant by colourimetric method.	MS	8	
	Repeat as per students	SG	4	
Feb	Repeat as per students	SK	4	
	Verification of Lambert Beer's Law. Conductometric titration of mixed acid.	MS	8	
	Repeat as per students	SG	4	
		TOTAL	110	

Resources:

Books:

1. Harris, D. C. *Quantitative Chemical Analysis*. 6th Ed., Freeman(2007)
2. Palit, S.R., De, S. K. *Practical Physical Chemistry* Science BookAgency
3. *University Hand Book of Undergraduate Chemistry Experiments*, edited by Mukherjee, G. N., University ofCalcutta

2. Other resources :

*Remarks will specify

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- Methodology of teaching (whether using ICT, engaging students in group discussion, quiz etc. etc.)
- Different modes of assessment. (Please check UGC evaluation reforms).

COURSE PLANER
Department of Chemistry
Basirhat College
Session: 2018-19
CEMA III-Year

Paper VIII/ Paper Code: CEMAP 38-Pr/ Total Marks: 75(PRACTICAL)+25(LNB+VIVA)
Course coordinator: Dr. Saheli Ganguly

Course planner

SL	Course Topic	Teacher	Class hour	Remarks
Jul	Inorganic Chemistry Complexometric estimation: (Ca^{2+} + Mg^{2+}) in solution.	SM	2	
Aug	Complexometric estimation: i) (Ca^{2+} + Mg^{2+}) in solution. ii)(Fe^{3+} + Al^{3+}) in solution.	SM	8	
Sept	Dichromatometry and iodometry estimation: ii) Fe^{3+} + Cu^{2+} iii) Fe^{3+} + Mn^{2+}.	SM	8	
Nov	Organic Preparation Preparation of an organic compound, purification and determination of its M.P.	SK	8	
	Permanganometry estimation: Fe^{3+} + Ca^{2+}. Analysis of Fe^{3+} in cement.	SM	8	
Dec	Organic Preparation Nitration (cold, hot), Condensation, Hydrolysis,	SK	8	
	Gravimetry: i) Ni^{2+} as glyoximato complex. ii) Cu^{2+} as CuSCN.	SM	8	
	Determination of temporary and permanent hardness in supplied water.	SG	4	
Jan	Organic Preparation Oxidation, Halogenation (Green method), acetylation.	SK	8	
	Repeat as per students	SG	4	
	Analysis of Fe^{3+} in cement. Gravimetry: i) Ni^{2+} as glyoximato complex.	SM	8	
Feb	Repeat as per students	SK	4	
	Repeat as per students	SG	4	

	TOTAL	82

Resources:

Books:

1. Mendham, J., *A. I. Vogel's Quantitative Chemical Analysis* 6th Ed., Pearson,2009.
2. Vogel, A. I. *Elementary Practical Organic Chemistry,* Part 2: *Qualitative Organic Analysis*, CBS Publishers andDistributors.
3. *University Hand Book of Undergraduate Chemistry Experiments*, edited by Mukherjee, G. N. University of Calcutta,2003.
4. Mann, F.G. & Saunders, B.C. *Practical Organic Chemistry,* Pearson Education (2009).
5. Furniss, B.S., Hannaford, A.J., Smith, P.W.G., Tatchell, A.R. *Practical Organic Chemistry,* 5th Ed.,Pearson(2012).
6. Clarke, H. T., *A Handbook of Organic Analysis (Qualitative and Quantitative)*, Fourth Edition, CBS Publishers and Distributors(2007).
7. *Practical Workbook Chemistry (Honours), UGBS, Chemistry,* University of Calcutta, 2015.

3. Other resources :

*Remarks will specify

- The nature of the class-topic (viz. Theoretical, Practical, and Tutorial).
- Methodology of teaching (whether using ICT, engaging students in group discussion, quiz etc. etc.)
- Different modes of assessment. (Please check UGC evaluation reforms).

COURSE PLANER
Department of Chemistry
Basirhat College
Session: 2018-19
CEMA II-Year

Paper III/ Paper Code: CEMAT 23-IA, 23-IB, 23-OA, 23-OB

Total Marks: 100

Course coordinator: DR. SUMAN MANDAL

Course planner

SL	Course Topic	Teacher	Class No	Remarks
Jul	CEMAT 23-IA Unit I. Chemical Periodicity II • General trends of variation of electronic configuration, elemental forms, metallic nature, magnetic properties (if any), catenation and catalytic properties (if any), oxidation states.	SM	3	
		MS	2	
	CEMAT 23-OA Unit-I ➢ UV: Electronic transitions (σ- σ*, n- σ*, π- π*, n- π*).	SK	2	

Aug	CEMAT 23-IA Unit I. Chemical Periodicity II • Inert pair effect (if any), aqueous and redox chemistry in common oxidation states, properties and reactions of important compounds such hydrides, halides, oxides, oxy-acids (if any), complex chemistry (if any) in respect of the following elements: (i) s-block elements: Li-Na-K, Be-Mg-Ca-Sr-Ba.	SM	6	
	CEMAT 23-IA Unit I. Chemical Periodicity II • (ii) p-block elements: B-Al-Ga-In-Tl, C-Si-Ge-Sn-Pb, N-P-As-Sb-Bi, O-S-Se-Te,F-Cl-Br-I, He-Ne-Ar-Kr-Xe.	BD	5	
	CEMAT 23-OA Unit-I ➢ IR: Modes of molecular vibration, application of Hook's law, force constant, factor influencing stretching frequency (H-bonding, mass, electronic factors, bond multiplicity, ring size, solvent effect, bond coupling), Fermi resonance, characteristic and diagnostic stretching frequencies of O-H, N-H, C-H, C-D, C=C, C=N, C=O, C≡C, C≡N functions.	SG	2	
		MS	2	
	CEMAT 23-OA Unit-I ➢ Factor influencing the relative position of λmax (conjugative effect, steric effect, solvent effect, conformational effect, effect of pH), relative intensity of absorption of allowed transition, transition moment, effective chromophor concentration, red shift (bathochromic shift), blue shift (hypsochromic shift), hyperchromic shift, hypochromic shift (typical examples).	SK	5	
Sept	CEMAT 23-IA Unit II. Other Types of Bonding • Molecular orbital concept of bonding (elementary pictorial approach) :sigma and pi-bonds, multiple bonding, MO diagrams of H_2, F_2, O_2, C_2, B_2, CO, NO, CN^-, HF, and HF_2^- ion, BeH_2, CO_2, magnetic properties, bond orders, bond lengths. Coordinate bonding: Lewis acid-base adducts (examples), double salts and complex salts, Werner theory of coordination compounds.	BD	3	
		MS	5	
	CEMAT 23-OA Unit-I ➢ ^{1}H-NMR: Nuclear spin, NMR active nuclei, principle of proton magnetic resonance, equivalent and non-equivalent protons, chemical shift(δ) , shielding and deshielding of protons, upfield and downfield shift, NMR peak area, spin-spin coupling(simple type), ^{1}H-NMR spectra of toluene, nitrobenzene, benzaldehyde, o-,m-,p-dichlorobenzene, dinitrobenzene, CH_3CH_2Br, CH_3CHBr_2, CH_2BrCH_2Br, $CHBr_2CH_2Br$, CH_3CH_2OH (ordinary and pure), *E*- and *Z*-2-butene, ethylene and acetylene, *E*- and *Z*- 1-Bromo-2-chloroethene.	SK	8	
	CEMAT 23-OA Unit-I ➢ Mass: Basic principle of mass spectroscopy	SG	2	

	CEMAT 23-IB Unit I • IUPAC nomenclature of coordination compounds (up to two metal centers). Coordination numbers, constitutional isomerism. Stereoisomerism in square planar and octahedral complexes. Hydrogen bonding and its effects on the physical properties and chemical properties of compounds of the main group elements.	SM	6	
Oct				
Nov	CEMAT 23-IB Unit I • Metallic bonding: qualitative idea of band theory, conducting, semi conducting and insulating properties with examples from main group elements.	MS	4	
	CEMAT 23-OA Unit II ➢ Phenol, ambident nucleophile: C- substitution versus O-substitution, reaction of phenols: Reimer-Tiemann reaction, Kolbe's reaction, Manasse reaction, alkylation, acetylation, Fries rearrangement, Claisen rearrangement, nitration, sulphonation, halogenation, oxidation (aerial), oxidative coupling by Fe^{3+}, Dakin reaction, Cumene-phenol rearrangement.	SK	8	
	CEMAT 23-IB Unit I • Ambidentate and polydentate ligands, chelate complexes, inermetalliccomplexes(formation as a function of pH and effect of entropy and ring size).	SM	2	
	CEMAT 23-IB Unit I • IUPAC nomenclature of coordination compounds (up to two metal centers). Coordination numbers, constitutional isomerism. Stereoisomerism in square planar and octahedral complexes.	BD	4	
Dec	CEMAT 23-IB Unit I • Hydrogen bonding and its effects on the physical properties and chemical properties of compounds of the main group elements. Metallic bonding: qualitative idea of band theory, conducting, semi conducting and insulating properties with examples from main group elements.	SM	6	
	CEMAT 23-OA Unit II ➢ Organometallic compounds: Preparation and synthetic applications of organomagnesium, organolithium, organozinc, organocopper, use of TMSCl, TMSI, TMSCN. Stereochemistry: cumulene with odd and even number of C=C, axial chirality (allene, spiro compound, alkylidene cycloalkanes, biphenyls (atropisomerism)), and R/S nomenclature.	SK	6	
Jan	CEMAT 23-OA Unit II ➢ Resolution of racemic acids, bases, and alcohols, optical purity/enantiomeric excess, topicity(topic attribute-chirotopic, achirotopic,; topic relationship-homotopic, enantitopic, diastereotopic), prochirality, Pro-r, Pro-s and re/si descriptor.	SM	2	
		MS	4	

	CEMAT 23-IB Unit I • Noble gases: oxides, fluorides and oxofluorides of xenon; chemical and photochemical reactions of ozone.	BD	4	
	CEMAT 23-OB Unit I ➢ Electrophilic substitution at α position of carbonyl compounds (D-exchange, nitrosation, halogenation, haloform reaction, SeO_2 oxidation), Baeyer-Villiger oxidation, concept of umpulong.	SK	6	
	CEMAT 23-IB Unit II. Precipitation and Redox Reactions • Elementary idea on standard redox potentials with sign conventions, Nernst equation. Influence of complex formation, precipitation and change of pH and ionic strength on redox potentials; formal potential.	BD	5	
Feb	CEMAT 23-OB Unit I ➢ Carboxylic acids and their derivatives: Nucleophilic substitution at the acyl carbon of acyl halide, anhydride, ester, carboxylic acid, amide, esterification of carboxylic acids and hydrolysis of ester-AAc^2, AAc^1, AAl^1, BAc^2, BAc^1,BAl^1 mechanisms, HVZ reaction, Claisen ester condensation, Bouveault Blanc reduction, decarboxylation reaction, Hunsdiecker reaction, action of heat on hydroxy acid.	SK	6	
		MS	3	
Mar	CEMAT 23-IB Unit II. Precipitation and Redox Reactions • Feasibility of a redox titration, redox potential at theequivalence point, redox indicators. Redox potential diagram (Latimer, Frost, Ellingham diagrams) of common elements and their applications. Disproportionation and comproportionation reactions (typical examples), Choice of redox indicators.	SM	4	
		BD	4	
Apr	CEMAT 23-OB Unit II ➢ Organonitrogen compounds: synthesis and reactions of nitroalkanes, alkylnitrites, alkyl cyanides and isocyanides, aliphatic amines, aromatic nitro, amines and diazo compounds, distinction and separation of 1^0,2^0,3^0 amines, diazomethane, diazoacetic ester-preparation and synthetic applications.	MS	4	
		SK	6	
		SM	6	
		Total:	131	

Resources:

Books:

1) J.D Lee Concise Inorganic Chemistry
2) Huheey, J. E et, al Inorganic Chemistry
3) I.LFinar Organic Chemistry (Volume-I)
4) J. March Advanced Organic Chemistry

Other resources : Class notes and e materials

*Remarks will specify

- The nature of the class-topic (viz. Theoretical, Practical, and Tutorial).
- Methodology of teaching (whether using ICT, engaging students in group discussion, quiz etc. etc.)

- Different modes of assessment. (Please check UGC evaluation reforms).

COURSE PLANER
Department of Chemistry
Basirhat College
Session: 2018-19
CEMA II-Year

Paper IV/ Paper Code: CEMAT 24-PA, 24-PB, CEMAP 24-PrA, 24-PrB

Total 100 marks)

Course coordinator: DR. SUMAN MANDAL

Course planner

SL	Course Topic	Teacher	Class No	Remarks
Jul	CEMAT 24-PA Unit-I : Quantum Chemistry I • Black body radiation: Rayleigh-Jeans and Planck's energy distribution law, Planck's theory, Wave-particle duality, light as particles: photoelectric and Compton effects; electrons as waves (electron diffraction experiment) and the de Broglie hypothesis.	SG	4	
	CEMAT 24-PB Unit-I : Thermodynamics(II) and Chemical Equilibrium ➢ Gibbs function (G) and Helmholtz function (A), criteria of thermodynamic equilibria and spontaneity, Maxwell's relations, variation of G and A with P, V and T, Thermodynamic equation of state.	BD	3	
Aug	CEMAT 24-PA Unit-I : Quantum Chemistry I • Elementary concepts of operators, eigenfunctions and eigenvalues. Linear operators. Commutation of operators, fundamental commutator and uncertainty relation (without proof). Expectation value. Hermitian operator. Schrödinger time-dependent and time-independent equation: nature of the equation, acceptability conditions imposed on the wave functions and probability interpretations of wave function, postulates of quantum mechanics.	SG	3	
		SM	3	
	CEMAT 24-PB Unit-I : Thermodynamics(II) and Chemical Equilibrium ➢ Clausius-Clapeyron equation, equilibrium between different phases, system of variable composition, partial molar quantities, chemical potential of a component in an ideal mixture, thermodynamic functions of mixing of ideal gases, Gibbs-Duhem equation, variation of chemical potential with T, P and mole fraction, thermodynamics of real gases – fugacity and activity determination.	BD	3	
		SK	3	

Sept	CEMAP 24-PrA Experiments: ❖ 1. Determination of surface tension of a given solution by the 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, $NaNO_3$ may be used.	BD+SM	8	
	CEMAT 24-PA <u>Unit-I : Quantum Chemistry I</u> • Particle in a box: setting up of Schrodinger equation for one-dimensional box and its solution. Comparison with free particle eigenfunctions and eigenvalues. Properties of PB wave functions (normalisation, orthogonality, probability distribution). Expectation values of x, x^2, p_x and p_x^2 and their significance in relation to the uncertainty principle. Extension of the particle in a one-dimensional problem to two and three dimensions and the concept of degenerate energy levels.	SG	3	
		SM	3	
	CEMAT 24-PB <u>Unit-I : Thermodynamics(II) and Chemical Equilibrium</u> ➢ Equilibrium constant and standard Gibbs free energy change. Definitions of KP, KC and Kx; van't Hoff's reaction isotherm, isobar and isochore from different standard states. Shifting of equilibrium due to change in external parameters e.g. temperature and pressure. Le Chatelier's principle and degree of advancement.	BD	6	
	CEMAP 24-PrA Experiments: ❖ 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 (V_0 and V_∞ to be supplied) 6. Determination of rate constant of decomposition of H_2O_2 by acidified KI solution using clock reactions.	SM+SG	10	
Oct				
Nov	CEMAT 24-PA <u>Unit-I : Quantum Chemistry I</u> • Simple Harmonic Oscillator: setting up of the Schrodinger equation, energy expression (without derivation), expression of wave function for n = 0 and n = 1 (without derivation) and their characteristic features.	SG	4	
	CEMAT 24-PB <u>Unit -II : Electrochemistry(Conductance, EMF and Ionic Equilibrium)</u> ➢ Conductance and measurement of conductance, cell constant, specific conductance and molar conductance. Variation of specific and equivalent conductance with	SM	6	

	dilution for strong and weak electrolytes. Kohlrausch's law of independent migration of ions, ion conductance and ionic mobility. Equivalent and molar conductance at infinite dilution and their determination for strong and weak electrolytes. Ostwald's dilution law.	BD	4	
	CEMAP 24-PrA Experiments: ❖ 7. Determination of the equilibrium constant of the reaction KI + I_2 = KI_3 by partition method (partition coefficient to be supplied). 8. Determination of pH of an unknown buffer solution by colour matching.	SM+BD	8	
Dec	CEMAT 24-PA <u>Unit-II : Quantum Chemistry II and Photochemistry</u> • 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.	SG MS	4 2	
	CEMAT 24-PB <u>Unit -II : Electrochemistry(Conductance, EMF and Ionic Equilibrium)</u> ➢ Debye-Huckel model (physical idea only). Application of conductance measurement (determination of solubility product and ionic product of water). Conductometric titrations. Determination of transport number by moving boundary method. CEMAP 24-PrB 25 marks(37L) <u>Qualitative inorganic analysis of mixtures containing not more than 4 radicals from the following:</u> ❖ Cation Radicals: Na^{+}, K^{+}, NH_4^{+}, Ca^{+2}, Sr^{+2}, Ba^{+2}, Al^{+3}, Mg^{+2}, Cr^{+3}, Mn^{+2}, Fe^{+2}, Fe^{+3}, Sn^{2+} , Co^{+2}, Ni^{+2}, Cu^{+2}, Zn^{+2}, Sb^{+3}.	BD SG+SM	4 8	
Jan	CEMAT 24-PA <u>Unit-II : Quantum Chemistry II and Photochemistry</u> • Potential energy curves (diatomic molecules), Qualitative idea of Born Oppenheimer approximation and Franck-Condon principle, 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 processes. Fluorescence and phosphorescence, Jablonsky diagram.	SG	5	
	CEMAT 24-PB <u>Unit -II : Electrochemistry(Conductance, EMF and Ionic Equilibrium)</u> ➢ Types of electrochemical cells and examples, cell reactions, emf and change in free energy, ΔH and ΔS of cell reactions from emf measurements. Thermodynamic derivation of Nernst equation. Standard cells. Half-cells/electrodes, different types of electrodes (with examples).	SM	6	
	<u>Qualitative inorganic analysis of mixtures containing not more</u>	SG+SM	8	

	<u>than 4 radicals from the following:</u> ❖ Anion Radicals: F^-, Cl^-, Br^-, BrO_3^-, I^-, SCN^-, S^{2-},SO_3^{2-} , SO_4^{2-} $S_2O_3^{2-}$, NO_3^-, NO_2^-, PO_4^{3-}, BO_3^{3-} CrO_4^{2-}/ $Cr_2O_7^{2-}$, $Fe(CN)_6^{4-}$, $Fe(CN)_6^{3-}$. IO_3^-			
Feb	CEMAT 24-PA <u>Unit-II : Quantum Chemistry II and Photochemistry</u> • Laws of photochemistry: Grotthus-Draper law, Stark-Einstein law of photochemical equivalence and Lambert-Beer's law; quantum yield and its measurement for a photochemical process, actinometry. Photostationary state. Photosensitized reactions. Kinetics of HI decomposition, H_2-Br_2 reaction, dimerisation of anthracene.	SG	4	
	CEMAT 24-PB <u>Unit -II : Electrochemistry(Conductance, EMF and Ionic Equilibrium)</u> ➢ Standard electrode potential (IUPAC convention) and principles of its determination. Types of concentration cells. Liquid junction potential and its minimization. Glass electrode and determination of pH of a solution. Potentiometric titrations: acid-base and redox.	BD	6	
	<u>Qualitative inorganic analysis of mixtures containing not more than 4 radicals from the following:</u> ❖ Insoluble Materials: Al_2O_3, Fe_2O_3, Cr_2O_3; SnO_2, $SrSO_4$, $BaSO_4$, CaF_2.	BD+SM	4	
Mar	CEMAT 24-PB <u>Unit -II : Electrochemistry(Conductance, EMF and Ionic Equilibrium)</u> ➢ Activity and activity coefficients of electrolyte/ion in solution. Debye-Huckel limiting law (statement and applications only). Solubility equilibrium and influence of common ions and indifferent ions thereon. pH, buffer solution, buffer capacity, salt hydrolysis (detailed treatment).	BD	4	
		MS	2	
	<u>Qualitative inorganic analysis of mixtures containing not more than 4 radicals from the following:</u> ❖ Detection of toxic metal ions and radicals (<u>*under special supervision*</u>): As^{3+}, AsO_4^{3-}, Bi^{3+}, Pb^{2+}, Hg_2^{2+}, Hg^{2+}, Cd^{2+}	BD+SM	6	
Apr-	Problem Solve	MS+SK+SM	4	
	<u>Qualitative inorganic analysis of mixtures containing not more than 4 radicals from the following:</u> ❖ Detection of radicals from unknown salts	SM+BD	4	
		Total:	142	

Resources:
Books:

1. P. W Atkins et. al Physical Chemistry
2. I. N Levine Physical Chemistry
3. S. Glasstone An Introduction to Electrochemistry
4. K. S dey and S. R Palit Practical Physical chemistry

Other resources: Class notes and e-materials

*Remarks will specify

- The nature of the class-topic (viz. Theoretical, Practical, and Tutorial).

- Methodology of teaching (whether using ICT, engaging students in group discussion, quiz etc. etc.)
- Different modes of assessment. (Please check UGC evaluation reforms).

Semester: I
Department of Chemistry
Basirhat College

SESSION: 2018-19(JULY-DEC 2018)

Lesson Plan for Course: Organic Chemistry I Code: CEMACOR01T
Credit: 4

- Course coordinator: DR. SWASTIK KARMAKAR
- Course Outcome

  - ✓ CO1:To impart students a broad outline of the basic organic chemistry in general.
  - ✓ CO2: The students will learn the Bonding of organic compounds in the light of valence bond and MO theories, Hybridization of organic compound and their Physical Properties, different types of organic reactions like ionic, radical and pericyclic etc., different types of reaction like: addition, elimination and substitution reactions, electrophiles and nucleophiles.

Course planner

Sl	Course Topic	Teacher	Class-hrs	Remarks
Jul				
Aug	*Valence Bond Theory:* concept of hybridisation, shapes of molecules, resonance (including hyperconjugation); calculation of formal charges and double bond equivalent (DBE);	PD	2	
	Valence Bond Theory: Orbital pictures of bonding (sp3, sp2, sp: C-C, C-N & C-O systems and *s-cis*and *s-trans* geometry for suitable cases).	MS	2	
	Electronic displacements: inductive effect, field effect, mesomeric effect, resonance energy; bond polarization and bond polarizability.	SM	2	
	Electronic displacements: Electromeric effect; steric effect, steric inhibition of resonance.	BD	2	
	MO theory: qualitative idea about molecular orbitals, bonding and antibonding interactions, idea about σ, σ^*, π, π^*, n – MOs; basic idea about Frontier MOs (FMO); concept of HOMO, LUMO and SOMO; interpretation of chemical reactivity in terms of FMO interactions.	SK	4	
	MO theory: sketch and energy levels of π MOs of i) acyclic p orbital system (C=C, conjugated diene, triene, allyl and pentadienyl systems) ii) cyclic p orbital system (neutral systems: [4], [6]-annulenes; charged systems: 3-,4-,5-membered ring systems).	SG	2	
Sep	*Physical properties:* influence of hybridization on bond properties: bond dissociation energy (BDE) and bond energy; bond distances, bond angles; concept of bond angle strain (Baeyer‟s strain theory);	SG	2	
	Physical properties: Melting point/boiling point and solubility of common organic compounds in terms of covalent & non-covalent intermolecular forces.	MS	2	
	Physical properties: polarity of molecules and dipole moments; relative stabilities of isomeric hydrocarbons in terms of heat of hydrogenation, heat of combustion and heat of formation.	PD	2	

	Mechanistic classification: ionic, radical and pericyclic (definition and example).	SM	2	
	Mechanistic classification: reaction type: addition, elimination and substitution reactions (definition and example); nature of bond cleavage and bond formation: homolytic and heterolytic bond fission.Hückel‟s rules for aromaticity up to [10]-annulene (including mononuclear heterocyclic compounds up to 6-membered ring); concept of antiaromaticity and homoaromaticity; non-aromatic molecules; Frost diagram; elementary idea about α and β; measurement of delocalization energies in terms of β for buta-1,3-diene, cyclobutadiene, hexa-1,3,5-triene and benzene.	SK	6	
Oct	*Mechanistic classification:* homogenic and heterogenic bond formation; curly arrow rules in representation of mechanistic steps; reagent type: electrophiles and nucleophiles (elementary idea); electrophilicity and nucleophilicity in terms of FMO approach.	SK	2	
Nov	*Reactive intermediates:* carbocations (carbenium and carbonium ions), carbanions, carbon radicals, carbenes:	PD	2	
	Reactive intermediates: generation and stability, structure using orbital picture and electrophilic/nucleophilicbehavior of reactive intermediates (elementary idea).	MS	2	
	Relative and absolute configuration: D/L and *R/S* descriptors; *erythro/threo*and *meso*nomenclature of compounds; *syn/anti* nomenclatures for aldols	SM	2	
	Bonding geometries of carbon compounds and representation of molecules: tetrahedral nature of carbon and concept of asymmetry;	SG	2	
	Fischer, sawhorse, flying-wedge and Newman projection formulae and their inter translations. *Concept of chirality and symmetry:* symmetry elements and point groups (*Cαv*, *Cnh*, *Cnv*, *Cn*, *Dαh*, *Dnh*, *Dnd*, *Dn*, *Sn*(*Cs*, *Ci*); molecular chirality and centre of chirality; asymmetric and dissymmetric molecules; enantiomers and diastereomers; concept of epimers; concept of stereogenicity, chirotopicity and pseudoasymmetry; chiral centres and number of stereoisomerism: systems involving 1/2/3-chiral centre(s) (AA, AB, ABA and ABC types).	SK	6	
Dec	*E*/*Z* descriptors for C=C, conjugated diene, triene, C=N and N=N systems; combination of *R/S*- and *E/ Z*- isomerisms.	PD	2	
	Optical activity of chiral compounds: optical rotation, specific rotation and molar rotation; racemic compounds, racemisation(through cationic, anionic, radical intermediates and through reversible formation of stable achiral intermediates).	SK	6	
	Optical activity of chiral compounds: resolution of acids, bases and alcohols via diastereomeric salt formation;	SG	2	
	Optical activity of chiral compounds: optical purity and enantiomeric excess.	MS	2	
	Invertomerism of chiral trialkylamines.	SM	2	
	Assessment: End-term Test		Total:56 Hrs	

Resources :

Books:

1. Clayden, J., Greeves, N. & Warren, S. *Organic Chemistry,* Second edition, Oxford University Press, 2012.
2. Sykes, P., *A guidebook to Mechanism in Organic Chemistry,* Pearson Education, 2003.
3. Eliel, E. L. &Wilen, S. H. *Stereochemistry of Organic Compounds*, Wiley: London, 1994.
4. Nasipuri, D. *Stereochemistry of Organic Compounds,*Wiley Eastern Limited.

1. Other resources :

*Remarks will specify

- The nature of the class-topic (viz. Theoretical, Practical, and Tutorial).
- Methodology of teaching (whether using ICT, engaging students in group discussion, quiz etc. etc.)
- Different modes of assessment. (Please check UGC evaluation reforms).

Semester: I
Department of Chemistry
Basirhat College
SESSION: 2018-19(JULY-DEC 2018)

Lesson Plan for Course: Organic Chemistry I Lab Code: CEMACOR01P
Credit: 2

- Course coordinator: DR. MONOJIT SARKAR
- Course Outcome

CO1: Based on solubility separation of different inorganic and organic liquid and solid compounds are discussed.

CO2: Recrystallization of the separated compounds is to be done.

Course planne

Sl	Course Topic	Teacher	Class-hrs	Remarks
Jul				
Aug	Separation, based upon solubility, by using common laboratory reagents like water (cold, hot), dil. HCl, dil. NaOH, dil. NaHCO3, *etc*., of components of a binary solid mixture; purification of any one of the separated components by crystallization and determination of its melting point. The composition of the mixture may be of the following types: Benzoic acid/*p*-Toluidine; *p*-Nitrobenzoic acid/*p*-Aminobenzoic acid; *p*-Nitrotoluene/*p*-Anisidine; *etc*.	MS+ SG	15	
Sep	Determination of boiling point of common organic liquid compounds e.g., ethanol, cyclohexane, chloroform, ethyl methyl ketone, cyclohexanone, acetylacetone, anisole, crotonaldehyde, mesityl oxide, *etc*. [Boiling point of the chosen organic compounds should preferably be less than 160 °C]	BD+ SM	15	
Oct				
Nov	Identification of a Pure Organic Compound *Solid compounds*: oxalic acid, tartaric acid, citric acid, succinic acid, resorcinol, urea, glucose, cane sugar, benzoic acid and salicylic acid	SK+ MS	15	
Dec	Identification of a Pure Organic Compound *Liquid Compounds*: formic acid, acetic acid, methyl alcohol, ethyl alcohol, acetone, aniline, dimethylaniline, benzaldehyde, chloroform and nitrobenzene	BD+ SM	15	
	Assessment: End-term Test		Total:60 Hrs	

Resources :

Books:

1. Bhattacharyya, R. C, *A Manual of Practical Chemistry.*
2. Vogel, A. I. *Elementary Practical Organic Chemistry*, Part 2: *Qualitative Organic Analysis*, CBS Publishers and Distributors.
3. Dutta, S, *B. Sc. Honours Practical Chemistry*, Bharati Book Stall.

2. Other resources :

*Remarks will specify

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Semester: I
Department of Chemistry
Basirhat College
SESSION: 2018-19(JULY-DEC 2018)

Lesson Plan for Course: Physical Chemistry I Code: CEMACOR02T Credit: 4

- Course coordinator: DR. BIDYUT DEBNATH
- Course Outcome

CO1: Following aspects of gas are discussed: Kinetic Theory of gases,Maxwell's distribution of speed and energy,Real gas and virial equation.

CO2: Zeroth, firstand second law of thermodynamics, laws of thermochemistry, different thermodynamic relations are discussed.

Course planne

Sl	Course Topic	Teacher	Class-hrs	Remarks
Jul				
Aug	Chemical Thermodynamics : Zeroth and 1st law of Thermodynamics: Intensive and extensive variables; state and path functions; isolated, closed and open systems; zeroth law of thermodynamics;Concept of heat, work, internal energy and statement of first law.	MS	2	
	Chemical Thermodynamics : enthalpy, *H*, relation between heat capacities, calculations of *q*, *w*, *U* and *H* for reversible, irreversible and free expansion of gases (ideal and van der Waals) under isothermal and adiabatic conditions; Joule‟s experiment and its consequence	BD	2	
	Kinetic Theory of gases: Concept of pressure and temperature; Collision of gas molecules; Collision diameter; Collision number and mean free path; Frequency of binary collisions (similar and different molecules); Rate of collision on wall and rate of effusion.	SK	4	
	Chemical Thermodynamics:Thermochemistry:Standard states; Heats of reaction; enthalpy of formation of molecules and ions and enthalpy of combustion and its applications.	SM	2	
	Chemical Thermodynamics: Laws of thermochemistry; bond energy, bond dissociation energy and resonance energy from thermochemical data.	SG	2	
	Chemical Thermodynamics: Kirchhoff‟s equations and effect of pressure on enthalpy of reactions; Adiabatic flame temperature; explosion temperature.	PD	2	
Sep	Kinetic Theory of gases: Maxwell‟s distribution of speed and energy: Nature of distribution of velocities. Maxwell's distribution of speeds in one, two and three dimensions; Kinetic energy distribution in one, two and three dimensions, calculations of average, root mean square and most probable values in each case; Calculation of number of molecules having energy $\geq \varepsilon$,	BD	4	
	Principle of equipartition of energy and its application to calculate the classical limit of molar heat capacity of gases	SK	2	

	Kinetic Theory of gases: Real gas and virial equation: Deviation of gases from ideal behavior; compressibility factor; Boyle temperature; Andrew's and Amagat's plots;	SM	2	
	van der Waals equation and its features; its derivation and application in explaining real gas behaviour, other equations of state (Berthelot, Dietrici).	MS	2	
	Kinetic Theory of gases: Existence of critical state, Critical constants in terms of van der Waals constants; Law of corresponding states;	SG	2	
	virial equation of state; van der Waals equation expressed in virial form and significance of second virial coefficient; Intermolecular forces (Debye, Keesom and London interactions; LennardJones potential - elementary idea)	PD	2	
Oct				
Nov	Chemical Thermodynamics: Second Law:Need for a Second law; statement of the second law of thermodynamics; Concept of heat reservoirs and heat engines; Carnot cycle; Physical concept of Entropy; Carnot engine and refrigerator; Kelvin – Planck and Clausius statements and equivalence of the two statements with entropic formulation.	BD	4	
	Chemical Thermodynamics: Carnot's theorem; Values of dQ/T and Clausius inequality; Entropy change of systems and surroundings for various processes and transformations.	MS	2	
	Chemical Thermodynamics: Entropy and unavailable work; Auxiliary state functions (G and A) and their variation with T, P and V. Criteria for spontaneity and equilibrium.	SG	2	
	Chemical Thermodynamics: Thermodynamic relations: Maxwell's relations; Gibbs- Helmholtz equation,	SM	2	
	JouleThomson experiment and its consequences;	PD	2	
	inversion temperature; Joule-Thomson coefficient for a van der Waals gas; General heat capacity relations	SK	2	
Dec	Chemical kinetics: Rate law, order and molecularity: Introduction of rate law, Extent of reaction; rate constants, order; Forms of rates of First, second and n-th order reactions; Pseudo first order reactions (example using acid catalyzed hydrolysis of methyl acetate).	BD	4	
	Chemical kinetics: Determination of order of a reaction by half-life and differential method; Opposing reactions, parallel reactions and consecutive reactions (with explanation of kinetic and thermodynamic control of products; all steps first order) ; Rate equation for the fast reaction	SG	2	
	Chemical kinetics: Role of T and theories of reaction rate: Temperature dependence of rate constant; Arrhenius equation, energy of activation; Rate-determining step and steady-state approximation – explanation with suitable examples; Collision theory;	MS	2	
	Lindemann theory of unimolecular reaction; outline of Transition State theory (classical treatment)	SK	2	
	Chemical kinetics: Homogeneous catalysis: Homogeneous catalysis with reference to acid-base catalysis; Primary kinetic salt effect;	SM	2	
	Enzyme catalysis; Michaelis-Menten equation, LineweaverBurk plot, turn-over number. Autocatalysis; periodic reactions	PD	2	
	Assessment: End-term Test		Total:56 Hrs	

Resources :

Books:

1. Rakshit, P.C., *Physical Chemistry* Sarat Book House
2. Atkins, P. W. & Paula, J. de *Atkins' Physical Chemistry*, Oxford University Press
3. Glasstone, S. & Lewis, G.N. *Elements of Physical Chemistry*
4. Atkins, P. W. & Paula, J. de *Atkins' Physical Chemistry*, Oxford University Press

3. Other resources :

*Remarks will specify

- The nature of the class-topic (viz. Theoretical, Practical, and Tutorial).
- Methodology of teaching (whether using ICT, engaging students in group discussion, quiz etc. etc.)
- Different modes of assessment. (Please check UGC evaluation reforms).

Semester: I
Department of Chemistry
Basirhat College
SESSION: 2018-19(JULY-DEC 2018)

Lesson Plan for Course: Physical Chemistry I Lab Code: CEMACOR02P Credit: 2

- Course coordinator: DR. SAHELI GANGULY
- Course Outcome

CO1: Some experiments of pH, kinetics of acid-catalyzed hydrolysis, kinetics of decomposition of H_2O_2, heat of neutralization, heat of solution are to be performed.

Course planne

Sl	Course Topic	Teacher	Class -hrs	Remarks
Jul				
Aug	Experiment 1: Determination of pH of unknown solution (buffer), by color matching method	MS+SG	12hrs	
	Experiment 2: Determination of heat of neutralization of a strong acid by a strong base	BD+SM	4 hrs	
Sep	Experiment 2: Determination of heat of neutralization of a strong acid by a strong base	BD+SG	8 hrs	
	Experiment 3: Study of kinetics of acid-catalyzed hydrolysis of methyl acetate	MS+SK	8 hrs	
Oct				
Nov	Experiment 4: Study of kinetics of decomposition of H2O2	BD+MS	10 hrs	
	Experiment 5: Determination of heat of solution of oxalic acid from solubility measurement	SM+SG	6 hrs	
Dec	Experiment 5: Determination of heat of solution of oxalic acid from solubility measurement	BD+SM	12hrs	
	Assessment: End-term Test		Total:60 Hrs	

Resources :

Books:

1. Viswanathan, B., Raghavan, P.S. *Practical Physical Chemistry* Viva Books (2009)
2. Mendham, J., A. I. Vogel‟s Quantitative Chemical Analysis 6th Ed., Pearson
3. Harris, D. C. *Quantitative Chemical Analysis*. 6th Ed., Freeman (2007)
4. Palit, S.R., De, S. K. *Practical Physical Chemistry* Science Book Agency
5. *University Hand Book of Undergraduate Chemistry Experiments*, edited by Mukherjee, G. N., University of Calcutta
6. Levitt, B. P. edited *Findlay's Practical Physical Chemistry* Longman Group Ltd.
7. Gurtu, J. N., Kapoor, R., *Advanced Experimental Chemistry* S. Chand & Co. Ltd

4. Other resources :

*Remarks will specify

- The nature of the class-topic (viz. Theoretical, Practical, and Tutorial).
- Methodology of teaching (whether using ICT, engaging students in group discussion, quiz etc. etc.)
- Different modes of assessment. (Please check UGC evaluation reforms).

Semester: II
Department of Chemistry
Basirhat College

SESSION: 2018-19(JANU-JUNE 2019)

Lesson Plan for Course: INORGANIC CHEMISTRY-ICode: CEMACOR03T Credit: 4

- Course coordinator: DR. Bidyut Debnath
- Course Outcome

CO1: Bohr's theory, its limitations and atomic spectrum of hydrogen atom
CO2: Wave mechanics: de Broglie equation, Heisenberg's Uncertainty Principle and its significance
CO3: Quantum numbers and their significance.

Course planner

Sl	Course Topic	Teacher	Class-hrs	Remarks
Jul	*Chemical periodicity* Modern IUPAC Periodic table, Effective nuclear charge, screening effects and penetration.	SG	2	
	Acid-Base reactions Acid-Base concept: Arrhenius concept, theory of solvent system (H_2O, NH_3, SO_2 and HF).	MS	2	
	Redox Reactions and precipitation reactions Ion-electron method of balancing equation of redox reaction.	SM	2	
	Extra nuclear Structure of atom Bohr's theory, its limitations and atomic spectrum of hydrogen atom.	BD	2	
Aug	*Acid-Base reactions* Bronsted-Lowry's concept, relative strength of acids, Pauling's rules. Lux-Flood concept, Lewis concept, group characteristics of Lewis acids.	MS	4	
	Redox Reactions and precipitation reactions Elementary idea on standard redox potentials with sign conventions, Nernst equation (without derivation). Influence of complex formation.	SM	4	
	Extra nuclear Structure of atom Sommerfeld's Theory. Wave mechanics: de Broglie equation, Heisenberg's Uncertainty Principle and its significance.	BD	4	
	Chemical periodicity Slater's rules, atomic radii, ionic radii (Pauling's univalent), covalent radii, lanthanide contraction. Ionization potential, electron affinity and electronegativity (Pauling's, Mulliken"s and Allred-Rochow's scales) and factors influencing these properties, group electronegativities. Group trends and periodic trends in these properties in respect of s-, p- and d-block elements. Secondary periodicity, Relativistic Effect, Inert paireffect.	SG	6	
Sep	*Acid-Base reactions* Solvent levelling and differentiating effects. Thermodynamic acidity parameters, Drago-Wayland equation. Superacids, Gas phase acidity and proton affinity.	MS	4	
	Redox Reactions and precipitation reactions Precipitation and change of pH on redox potentials; formal potential.	SM	4	

	Feasibility of a redox titration.			
	Extra nuclear Structure of atom Schrödinger's wave equation, significance of ψ and ψ^2. Quantum numbers and their significance. Radial and angular wave functions for hydrogen atom.	BD	4	
	Redox Reactions and precipitation reactions Redox potential at the equivalence point, redox indicators.	SG	4	
Oct				
Nov	*Acid-Base reactions* *HSAB principle.Acid-baseequilibria in aqueous solution (Proton transfer equilibria in water), pH, buffer.Acidbaseneutralisation curves; indicator,*	MS	4	
	Redox Reactions and precipitation reactions Redox potential diagram (Latimer and Frost diagrams) of common elements and their applications. Disproportionation and comproportionation reactions. Solubility product principle.	SM	4	
	Extra nuclear Structure of atom Radial and angular distribution curves. Shapes of *s*, *p*, *d* and *f* orbitals. Pauli's Exclusion Principle, Hund's rules and multiplicity, Exchange energy. Ground state Term symbols of atoms and ions for atomic number upto 30.	BD	4	
	Redox Reactions and precipitation reactions Common ion effect and their applications to the precipitation and separation of common metallic ions as hydroxides, sulfides, phosphates, carbonates, sulfates and halides.	SG	4	
Dec	*Acid-Base reactions* choice ofindicators.	MS	1	
	Extra nuclear Structure of atom Aufbau principle and its limitations.	BD	1	
	Assessment: End-term Test	Total: 60 Hrs		

Resources :

Books:

1. Lee, J. D. *Concise Inorganic Chemistry*,5th Ed., Wiley India Pvt. Ltd.,2008.
2. Douglas,B.E.andMcDaniel,D.H.*Concepts&ModelsofInorganicChemistry* Oxford, 1970.
3. Day, M.C. and Selbin, J. *Theoretical Inorganic Chemistry*, ACS Publications, 1962.
4. Atkin, P. *Shriver & Atkins' Inorganic Chemistry,* 5th Ed., Oxford University Press (2010).
5. Cotton,F.A.,Wilkinson,G.andGaus,P.L.,*BasicInorganicChemistry3rd Ed.;*Wiley India.
6. Sharpe, A.G., *Inorganic Chemistry*, 4th Indian Reprint (Pearson Education)2005.
7. Huheey, J. E.; Keiter, E.A. &Keiter, R.L. *Inorganic Chemistry, Principles ofStructure and Reactivity 4th Ed.*, Harper Collins 1993,Pearson,2006.
8. Atkins, P.W. & Paula, J. *Physical Chemistry*, Oxford Press,2006.
9. Mingos, D.M.P., *Essential trends in inorganic chemistry*. Oxford University Press (1998).
10. Winter, M. J., The Orbitron, http://winter.group.shef.ac.uk/orbitron/ (2002). An illustrated gallery of atomic and molecularorbitals.
11. Burgess, J., *Ions in solution: basic principles of chemical interactions.* Ellis Horwood(1999).

5. Other resources :

*Remarks will specify

- The nature of the class-topic (viz. Theoretical, Practical, and Tutorial).

- Methodology of teaching (whether using ICT, engaging students in group discussion, quiz etc. etc.)
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Semester: II
Department of Chemistry
Basirhat College
SESSION: 2018-19(JANU-JUNE 2019)

Lesson Plan for Course: INORGANIC CHEMISTRY-I LABCode: CEMACOR03P Credit: 2

- Course coordinator: DR. MONOJIT SARKAR
- Course Outcome

CO1: They will learn how simple acid base titrations are to be done.
CO2: Student will gather knowledge about different oxidation reduction titrations which helps them to estimate ions in a solution.

Course planne

Sl	Course Topic	Teacher	Class -hrs	Remarks
Jul	A)Estimation of carbonate and hydroxide present together in mixture	MS+SG	2	
	C) Estimation of free alkali present in different soaps/detergents	SG+BD	2	
Aug	A)Estimation of carbonate and hydroxide present together in mixture. B)Estimation of carbonate and bicarbonate present together in a mixture.	MS+SG	8	
	C) Estimation of free alkali present in different soaps/detergents. D) Estimation of Fe(II) using standardized $KMnO_4$solution	SG+BD	8	
Sep	Estimation of oxalic acid and sodium oxalate in a givenmixture.	MS+SG	8	
	Estimation of Fe(II) and Fe(III) in a given mixture using $K_2Cr_2O_7$solution	SG+BD	8	
Oct	Estimation of Fe(III) and Mn(II) in a mixture using standardized $KMnO_4$solution.	MS+SG	2	
	Estimation of Fe(III) and Mn(II) in a mixture using standardized $KMnO_4$solution.	SG+BD	2	
Nov	Estimation of Fe(III) and Cu(II) in a mixture using$K_2Cr_2O_7$.	MS+SG	8	
	Estimation of Fe(III) and Cr(III) in a mixture using $K_2Cr_2O_7$.	SG+BD	8	
Dec	Repeat as per the need of the student.	MS+SG	2	
	Repeat as per the need of the student.	SG+BD	2	
	Assessment: End-term Test		Total:60 Hrs	

Resources :

Books:

1. Bhattacharyya, R. C, *A Manual of Practical Chemistry.*
2. Vogel, A. I. *Elementary Practical Organic Chemistry,* Part 2: *Qualitative Organic Analysis,* CBS Publishers and Distributors.
3. Dutta, S, *B. Sc. Honours Practical Chemistry*, Bharati Book Stall.

6. Other resources :

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Semester: II
Department of Chemistry
Basirhat College
SESSION: 2018-19(JANU-JULY 2019)

Lesson Plan for Course: ORGANIC CHEMISTRY-IICode: CEMACOR04T Credit: 4

- Course coordinator: DR. BIDYUT DEBNATH
- Course Outcome

CO1: Students will get a clear conception on "Chirality arising out of stereoaxis".

CO2: The students will learn about "Prostereoisomerism" which includes the concept of prostereogeniccentre, (pro)n-chirality, topicity of ligands and faces (elementary idea), pro-R/pro-S, pro-E/pro-Z,Re/Si descriptors, pro-r and pro-s descriptors of ligands on propseudoasymmetriccentre.

Course planne

Sl	Course Topic	Teacher	Class-hrs	Remarks
Jul	Substitution and Elimination Reactions *Free-radical substitution reaction:* halogentaion of alkanes, mechanism (with evidence) and stereochemical features; reactivity-selectivity principle in the light of Hammond's postulate.	SG	2	
	Stereochemistry II Chirality arising out of stereoaxis: stereoisomerism of substituted cumulenes with even and odd number of double bonds; chiral axis in allenes, spiro compounds, alkylidenecycloalkanes and biphenyls; related configurational descriptors (R_a/S_a and P/M); atropisomerism; racemisation of chiral biphenyls; buttressingeffect.	SK	4	
	General Treatment of Reaction Mechanism II *Reaction thermodynamics:* free energy and equilibrium, enthalpy and entropy factor, calculation of enthalpy change via BDE, intermolecular &intramolecular reactions.	PD	2	
Aug	Substitution and Elimination Reactions *Elimination reactions:* E1, E2, E1cB and Ei (pyrolytic*syn*eliminations).	SG	2	
	Stereochemistry II Concept of prostereoisomerism: prostereogeniccentre; concept of $(pro)^n$-chirality: topicity of ligands and faces (elementary idea); pro-R/pro-S, pro-E/pro-Z and Re/Si descriptors; pro-r and pro-s descriptors of ligands on propseudoasymmetriccentre. Conformation: conformational nomenclature: eclipsed, staggered, gauche, syn and anti; dihedral angle, torsion angle.	SK	8	
	General Treatment of Reaction Mechanism II *Concept of organic acids and bases:* effect of structure, substituent and solvent on acidity and basicity; proton sponge; gas-phase acidity and basicity; comparison between nucleophlicity and basicity; HSAB principle; application of thermodynamic principles in acid-baseequilibria.	PD	4	
Sep	Substitution and Elimination Reactions Formation of alkenes and alkynes; mechanisms (with evidence), reactivity, regioselectivity (Saytzeff/Hofmann) and stereoselectivity; comparison between substitution and elimination; importance of Bredt's rule relating to the formation of C=C.	SG	4	
	Stereochemistry II	SK	8	

	Klyne-Prelog terminology; P/M descriptors; energy barrier of rotation, concept of torsional and steric strains; relative stability of conformers on the basis of steric effect, dipole-dipole interaction and H-bonding; butane gauche interaction; conformational analysis of ethane, propane, n-butane, 2methylbutane and 2,3- dimethylbutane; haloalkane, 1,2-dihaloalkanes and 1,2-diols (up to four carbons); 1,2- halohydrin; conformation of conjugated systems (s-cis and s-trans).			
	General Treatment of Reaction Mechanism II *Tautomerism:* prototropy (keto-enol, nitro - *aci*-nitro, nitroso-oximino, diazo-amino and enamine-imine systems); valence tautomerism and ring-chain tautomerism.	PD	4	
Oct	General Treatment of Reaction Mechanism II Composition of the equilibrium in different systems (simple carbonyl; 1,2- and 1,3dicarbonyl systems, phenols and related systems), factors affecting keto-enoltautomerism; application of thermodynamic principles in tautomericequilibria.	SK PD SG	2 1 1	
Nov	General Treatment of Reaction Mechanism II *Reaction kinetics:* rate constant and free energy of activation; concept of order and molecularity; free energy profiles for one-step, two-step and three-step reactions.	SG	4	
	Substitution and Elimination Reactions *Nucleophilic substitution reactions:* substitution at sp^3centre: mechanisms (with evidence), relative rates &stereochemical features: S_N1, S_N2, S_N2', S_N1' (allylic rearrangement) and S_Ni; effects of solvent, substrate structure, leaving group and nucleophiles (including ambident nucleophiles, cyanide & nitrite); substitutions involving NGP.	SK	8	
	General Treatment of Reaction Mechanism II Catalyzed reactions: electrophilic and nucleophilic catalysis; kinetic control and thermodynamic control of reactions; isotope effect: primary and secondary kinetic isotopic effect (k_H /k_D); principle of microscopic reversibility; Hammond'spostulate.	PD	4	
Dec	Substitution and Elimination Reactions Role of crown ethers and phase transfer catalysts; [systems: alkyl halides, allyl halides, benzyl halides, alcohols, ethers, epoxides].	SK	2	
	Assessment: End-term Test	Total: 60 Hrs		

Resources :

Books:

1. Clayden, J., Greeves, N., Warren, S. *Organic Chemistry*, Second edition, Oxford University Press2012.
2. Sykes, P., *A guidebook to Mechanism in Organic Chemistry,* Pearson Education, 2003.
3. Smih, J. G. *Organic Chemistry,* Tata McGraw-Hill Publishing Company Limited.
4. Carey, F. A. &Guiliano, R. M. *Organic Chemistry*, Eighth edition, McGraw Hill Education,2012.
5. Loudon, G. M. *Organic Chemistry*, Fourth edition, Oxford University Press, 2008.
6. Eliel, E. L. &Wilen, S. H. *Stereochemistry of Organic Compounds*, Wiley: London,1994.
7. Nasipuri, D. *Stereochemistry of Organic Compounds*, Wiley EasternLimited.
8. Morrison, R. N. & Boyd, R. N. *Organic Chemistry*, Dorling Kindersley (India) Pvt. Ltd. (PearsonEducation).
9. Finar, I. L. *Organic Chemistry (Volume 1)* Pearson Education.
10. Graham Solomons, T.W., Fryhle, C. B. *Organic Chemistry*, John Wiley & Sons, Inc.

11. James, J., Peach, J. M. *Stereochemistry at a Glance*, Blackwell Publishing,2003.
12. Robinson, M. J. T., *Stereochemistry*, Oxford Chemistry Primer, Oxford University Press,2005.
13. Maskill, H., *Mechanisms of Organic Reactions*, Oxford Chemistry Primer, Oxford UniversityPress.

7. Other resources :

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Semester: II
Department of Chemistry
Basirhat College
SESSION: 2018-19(JAN-JULY2019)

Lesson Plan for Course: Organic Chemistry I LabCode: CEMACOR04P Credit: 2

- Course coordinator: Dr. SumanMandal
- Course Outcome
  - ✓ CO1: Some reactions and its mechanism will be performed by the students.

Course planner

The following reactions are to be performed, noting the yield of the crudeproduct. Crystaliation of the crude product and melting point are also to be detected by the student.				
Sl	Course Topic	Teacher	Class-hrs	Remarks
Jul	Nitration of aromaticcompounds.	SK+SM	2	
	Nitration of aromaticcompounds.	SK+MS	2	
Aug	Condensationreactions, Hydrolysis of amides/imides/esters	SK+SM	8	
	Acetylation of phenols/aromaticamines, Benzoylation of phenols/aromaticamines	SK+MS	8	
Sep	Side chain oxidation of aromaticcompounds, Diazo coupling reactions of aromaticamines	SK+SM	8	
	Bromination of anilides using green approach (Bromate-Bromidemethod)	SK+MS	8	
Oct	Redox reaction including solid-phase method	SK+SM	2	
	Redox reaction including solid-phase method	SK+MS	2	
Nov	Green multi-component-coupling reaction	SK+SM	8	
	Selective reduction of *m*-dinitrobenzene to*m*-nitroaniline.	SK+MS	8	
Dec	Repeat as per the need of the student.	SK+SM	2	
	Repeat as per the need of the student.	SK+MS	2	
	Assessment: End-term Test		Total:60 Hrs	

Resources:

Books:

1. Vogel, A. I. *Elementary Practical Organic Chemistry*, Part 1: *Small scale Preparations*, CBS Publishers andDistributors.
2. *University Hand Book of Undergraduate Chemistry Experiments*, edited by

Mukherjee, G. N. University of Calcutta,2003.

3. Mann, F.G. & Saunders, B.C. *Practical Organic Chemistry,* Pearson Education (2009).
4. Furniss, B.S., Hannaford, A.J., Smith, P.W.G. &Tatchell, A.R. *Practical Organic Chemistry, 5th Ed.* Pearson (2012).
5. Ahluwalia, V.K. &Aggarwal, R. *Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis,* University Press(2000).
6. *Practical Workbook Chemistry (Honours), UGBS, Chemistry*, University of Calcutta, 2015.

Other resources :

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