[I] Lecture Notes / Study Materials for Chemistry Honours Students (CEMA), CC-3, CBCS

1. Stereochemistry II

[A] Chirality arising out of Stereoaxis

(i) Study Material-1 (Part-1, PPT-1) is available here. (Contents: Introduction; concept of chiral axis; stereoisomerism of substituted allenes; optically active allenes; nature of stereoisomerism in substituted cumulenes) [uploaded on 25. 03. 2022]

(ii) Study Material-2 (Part-2, PPT-2) is available here. (Contents: Chiral axis in *spiro*-compounds; chiral axis in alkylidenecycloalkanes; chiral axis in biphenyls; atropisomerism) [uploaded on 27. 03. 2022]

(iii) Study Material-3 (Part-3, PPT-3) is available here. (Contents: Configurational descriptors (*R*-, *S*-) of axially chiral molecules: Configurational descriptors of chiral allenes; configurational descriptors of chiral spiranes; configurational descriptors of chiral alkylidenecycloalkanes; configurational descriptors of chiral biphenyls and related compounds) [uploaded on 03. 04. 2022]

(iv) Study Material-4 (Part-4, PPT-4) is available here. (Contents: Racemization of chiral biphenyls; buttressing effect) [uploaded on 03. 04. 2022]

[B] Concept of Prostereoisomerism

(i) Study Material-1 (Part-1, PPT-5) is available here. (Contents: Concept of prostereogenic centre; concept of (pro)-chirality) [uploaded on 07. 04. 2022]

(ii) Study Material-2 (Part-2, PPT-6) is available here. (Contents: Topicity of ligands and faces: Introduction; homotopic Ligands; homotopic faces) [uploaded on 10. 04. 2022]

(iii) Study Material-3 (Part-3, PPT-7) is available here. (Contents: Enantiotopic ligands and faces: Introduction; enantiotopic ligands; enantiotopic faces) [uploaded on 20. 04. 2022]

(iv) Study Material-4 (Part-4, PPT-8) is available here. (Contents: Diastereotopic of ligands and faces: Introduction; criteria: substitution-addition criterion and symmetry criterion; generalized statement on topicity of ligands and faces; summary of topic relationships) [uploaded on 20. 04. 2022]

(v) Study Material-5 (Part-5, PPT-9) is available here. (Contents: Stereodescriptor-I: Nomenclature of stereoheterotopic ligands and faces: Introduction; nomenclature for stereoheterotopic ligands: *pro-R/pro-S* descriptors; stereodescriptors of enantiotopic ligands; stereodescriptors of diastereotopic ligands; molecules with a prochiral axis; *pro-r/pro-s* descriptors of ligands on *pro-pseudoasymmetric* centre) [uploaded on 23. 04. 2022]

(vi) Study Material-6 (Part-6, PPT-10) is available here. (Contents: Stereodescriptor-II: Molecules with prostereogenic but prochiral centre: *pro-E/pro-Z* descriptors for stereoheterotopic faces; *Re/Si*-descriptors of prochiral faces; enantiotopic faces; diastereotopic faces; stereochemistry of the nucleophilic addition product; addition of Grignard reagent to an unsymmetrical ketone; addition of $LiAlH_4$ to an unsymmetrical ketone) [uploaded on 23. 04. 2022]

[C] Conformation

(i) Study Material-1 (Part-1, PPT-11) is available here. (Contents: Conformation (Part-1): Concept on dihedral / torsion angle; concept on configuration; concept on conformation; conformational nomenclature: *eclipsed*, *staggered*, *gauche*, *syn*, and *anti;* Klyne-Prelog terminology; Conformational Selection Rules) [uploaded on 28. 04. 2022]

(ii) Study Material-2 (Part-2, PPT-12) is available here. (Contents: Conformation (Part-2): Total strain energy of a molecule; concept of torsional and steric strains; conformational analysis: introduction; conformational analysis of ethane and propane) [uploaded on 28. 04. 2022]

(iii) Study Material-3 (Part-3, PPT-13) is available here. (Contents: Conformation (Part-3): Conformational analysis of *n*-butane; *butane-gauche* interaction; conformational analysis of 2-methylbutane and 2,3-methylbutane) [uploaded on 12. 05. 2022]

(iv) Study Material-4 (Part-4, PPT-14) is available here. (Contents: Conformation (Part-4): Conformational analysis of haloalkanes, 1,2-dihaloalkanes and 2,3-dihaloalkanes) [uploaded on 12. 05. 2022]

(v) Study Material-5 (Part-5, PPT-15) is available here. (Contents: Conformation (Part-5): Conformational analysis of 1,2-diols and 1,2-halohydrins; conformational analysis of conjugated systems (*s–cis* and *s–trans*)) [uploaded on 24. 05. 2022]

2. Nucleophilic Substitution Reactions

(i) Study Material-1 (Part-1, PPT-16) is available here. (Contents: General features of nucleophilic substitution reaction; nucleophiles; base / nucleophile dichotomy; nucleophilicity versus basicity; steric effect and nucleophilicity; leaving groups) [uploaded on 26. 05. 2022; Revised on 06. 06. 2023]

(ii) Study Material-2 (Part-2, PPT-17) is available here. (Contents: Solvent effects: (i) polar protic solvents, (ii) polar aprotic solvents; possible mechanisms for nucleophilic substitution reaction – Two mechanisms for nucleophilic substitution; kinetics of S_N2 and S_N1 reactions) [uploaded on 26. 05. 2022; Revised on 06. 06. 2023]

(iii) Study Material-3 (Part-3, PPT-18) is available here. (Contents: S_N2 Reactions (Part I): introduction; The S_N2 mechanism; stereochemistry of the S_N2 reaction; The transition state for an S_N2 reaction; HOMO-LUMO interactions in an S_N2 reaction; The identity of the R group) [uploaded on 30. 05. 2022; Revised on 06. 06. 2023]

(iv) Study Material-4 (Part-4, PPT-19) is available here. (Contents: S_N2 reactions (Part II): Evidence in favour of S_N2 reaction; determination of relative configuration; solvent effects in substitution reactions; solvent effects in S_N2 reactions) [uploaded on 06. 06. 2022; Revised on 06. 06. 2023]

(v) Study Material-5 (Part-5, PPT-20) is available here. (Contents: S_N1 reactions (Part I): The S_N1 reaction; A mechanism for the S_N1 reaction; determination of relative configuration; The structure of intermediate carbocations; The stereochemistry of S_N1 reactions: reactions that involve racemization) [uploaded on 06. 06. 2022; Revised on 06. 06. 2023]

(vi) Study Material-6 (Part-6, PPT-21) is available here. (Contents: S_N1 reactions (Part II): Evidence for the intermediacy of carbocation in S_N1 reaction; solvolysis reactions; solvent effects on S_N1 reactions: The ionizing ability of the solvent; The Hammond-Leffler Postulate and the S_N1 reaction; problems) [uploaded on 10. 06. 2022; Revised on 06. 06. 2023]

(vii) Study Material-7 (Part-7, PPT-22) is available here. (Contents: Factors affecting the rates of S_N1 and S_N2 reactions (Part I): Introduction; The effect of the structure of the substrate (Part I); Steric hindrance and steric acceleration in nucleophilic substitution reaction; problems) [uploaded on 07. 06. 2022; Revised on 06. 06. 2023]

(viii) Study Material-8 (Part-8, PPT-23) is available here. (Contents: Factors affecting the rates of S_N1 and S_N2 reactions (Part II): The effect of the structure of the substrate (Part II); substitution of allylic halides; substitution of benzylic halides; substitution with *α*-halo carbonyl compounds; substitution with alkoxymethyl chloride; acid catalyzed hydrolysis of acetals; substitution at the bridgehead atom) [uploaded on 13. 06. 2022; Revised on 06. 06. 2023]

(ix) Study Material-9 (Part-9, PPT-24) is available here. (Contents: Factors affecting the rates of S_N1 and S_N2 reactions (Part III): Ethers as electrophiles: cleavage of ethers; ambident substrates: cleavage of epoxides; The effect of the concentration and strength of the nucleophile; nucleophilicity versus basicity; type of nucleophiles: hard or soft; ambident nucleophile in substitution reactions; nucleophiles with alpha effect; problems) [uploaded on 13. 06. 2022; Revised on 06. 06. 2023]

(x) Study Material-10 (Part-10, PPT-25) is available here. (Contents: Factors affecting the rates of S_N1 and S_N2 reactions (Part IV): Solvent effects: (i) on S_N2 reactions, (ii) on S_N1 reactions; The nature of the leaving group; summary of S_N1 and S_N2 reactions; nucleophilic catalysis; problems) [uploaded on 17. 06. 2022; Revised on 06. 06. 2023]

(xi) Study Material-11 (Part-11, PPT-26) is available here. (Contents: Phase Transfer Catalyst (PTC); salt effect and special salt effect in nucleophilic substitutions; problems: solved and unsolved) [uploaded on 24. 06. 2022; Revised on 02. 06. 2023]

(xii) Study Material-12 (Part-12, PPT-27) is available here. (Contents: Formation, stability and reactions of allylic carbocations; Allylic rearrangement; S_Ni reaction; problems) [uploaded on 24. 06. 2022; Revised on 06. 06. 2023]

(xiii) Study Material-13 (Part-13, PPT-28) is available here. (Contents: Neighbouring Group Participation (NGP) (Part I): Neighbouring Group Participation: Introduction; mechanistic interpretation; reaction of 3-bromo-2-butanol (*threo/erythro*) with HBr; acetolysis of 3-methoxy-2-bromobutane; base catalyzed hydrolysis of the 1,2-chlorohydrin; base catalyzed hydrolysis of the 2-bromopropanoate anion; participation of sulphur as neighbouring group; participation of nitrogen as neighbouring group) [uploaded on 29. 06. 2022; Revised on 06. 06. 2023]

(xiv) Study Material-14 (Part-14, PPT-29) is available here. (Contents: Neighbouring Group Participation (NGP) (Part II): Acetolysis of 4-methoxy-1-pentyl brosylate and 5-methoxy-2-pentyl brosylate; participation of chlorine as neighbouring group; formation of bridged phenonium Ion; acetolysis of 3-phenyl-2-butyl tosylates (*threo*– and *erythro*-); acetolysis of 2-phenyl-3-pentyl tosylates (*threo*– and *erythro*-); acetolysis of 3-phenyl-2-pentyl tosylates (*threo*– and *erythro*-) [uploaded on 29. 06. 2022; Revised on 06. 06. 2023]

3. PREVIOUS YEARS QUESTIONS (PYQ) / MODEL QUESTIONS / ASSIGNMENTS

[A] PREVIOUS YEARS QUESTIONS (PYQ) / MODEL QUESTIONS

(i) PYQ (15 years) on Axial Chirality (STEREOCHEMISTRY-II): Questions (uploaded on 18. 03. 2023) are available here.

(ii) PYQ (15 years) on Pro-stereoisomerism (STEREOCHEMISTRY-II): Questions (uploaded on 04. 04. 2023) are available here.

(iii) PYQ (15 years) on ConformationS (STEREOCHEMISTRY-II): Questions (uploaded on 19. 04. 2023) are available here.

(iv) PYQ (15 years) on NUCLEOPHILIC SUBSTITUTION REACTIONS: Questions (uploaded on 05. 05. 2023) are available here.

[B] ASSIGNMENTS

(i) SET-1 (MCQ) on STEREOCHEMISTRY-II: Questions (uploaded on 08. 05. 2023) are available here.

(ii) SET-2 (MCQ) on NUCLEOPHILIC SUBSTITUTION REACTIONS: Questions (uploaded on 10. 06. 2023) are available here.