



Department of Chemistry and Chemical Sciences
CENTRAL UNIVERSITY OF JAMMU
 Rahya-Suchani (Bagla), District-Samba,
 Jammu-181143, (J&K) India

Five-year Integrated M.Sc. Chemistry
Teaching Plan (Jan 2021-July 2021)

Semester: VIII
 Course: Organic Synthesis and Reaction Mechanism (ICCHM8E001T)
 Course Teacher: Dr. Princy Gupta

Week	Lecture No./Day	Topic to be Taught	No of Hours	Suggested Readings
1 st Week	I	Aliphatic nucleophilic substitution: S _N 1, S _N 2, Reactivity, Structural and solvent effects, Stereochemical aspects,	1	1, 2, 3, 4
	II	S _N i and SET mechanisms, Reactivity, Structural and solvent effects, Stereochemical aspects,	1	1, 2, 3, 4
	III	The neighboring group mechanism, Substitution in norbornyl and bridge-head systems,	1	1, 2, 3, 4
	IV	Substitution at benzylic, allylic and vinylic carbons, Substitution at <i>sp</i> ² carbons,	1	1, 2, 3, 4
2 nd Week	I	Alkylation and acylation of amines, Alkylation and acylation of active methylene compounds,	1	1, 2, 3, 4
	II	Hydrolysis of esters	1	1, 2, 3, 4
	III	Claisen and Dieckmann condensation	1	1, 2, 3, 4
	IV	Aromatic nucleophilic substitution: S _N Ar via Meisenheimer complex	1	1, 2, 3, 4
3 rd Week	I	Benzyne and S _{RN} 1 mechanisms, Reactivity,	1	1, 2, 3, 4
	II	Cine substitution, Chichibabin reaction.	1	1, 2, 3, 4
	III	Electrophilic substitution: S _E 1, S _E 2 and S _E i Mechanisms, Aromatic electrophilic substitution via Wheland intermediates,	1	1, 2, 3, 4
	IV	Orientation and reactivity, Ortho effect, Substitution of H ⁺ versus ipso substitution,	1	1, 2, 3, 4
4 th Week	I	Ar-Halogen, Ar-SO ₃ H	1	1, 2, 3, 4
	II	Ar-NO ₂ bond formation, Diazonium coupling,	1	1, 2, 3, 4
	III	Friedel-Crafts related reactions and Vilsmeier-Haack.	1	1, 2, 3, 4
	IV	Addition reactions: Addition to C-C multiple bonds, Electrophilic, nucleophilic and free radical addition, Mechanisms	1	1, 2, 3, 4
5 th Week	I	Orientation and reactivity, Stereochemistry of addition reactions of alkenes: Bromine addition,	1	1, 2, 3, 4
	II	Hydrogen bromide addition, Catalytic hydrogenation	1	1, 2, 3, 4
	III	Hydroboration-oxidation,	1	1, 2, 3, 4
	IV	1,2 and 1,4-additions of organometallic reagents (Mg, R ₂ CuLi	1	1, 2, 3, 4



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6 th Week	I	Michael addition	1	1, 2, 3, 4
	II	Addition to C-heteroatom multiple bond	1	1, 2, 3, 4
	III	Elimination reactions: E1, E2 Mechanisms, Regioselectivity, Stereochemistry of elimination	1	1, 2, 3, 4
	IV	E1cB Mechanisms, Regioselectivity, Stereochemistry of elimination:	1	1, 2, 3, 4
7 th Week	I	Cyclic and acyclic systems, Bredt's rule,	1	1, 2, 3, 4
	II	Pyrolytic elimination, Chugaev reaction, Hofmann degradation, Shapiro reaction, Cope elimination	1	1, 2, 3, 4
	III	Competition between substitution and elimination	1	1, 2, 3, 4
	IV	Molecular rearrangements: Mechanism and stereochemical aspects of Pinacol-pinacolone, Demjanov rearrangements	1	1, 2, 3, 4
8 th Week	I	Wagner-Meerwein Pummerer rearrangements	1	1, 2, 3, 4
	II	Beckmann, Schmidt Hofmann rearrangements	1	1, 2, 3, 4
	III	Benzilbenzilic acid, Favorskii rearrangements	1	1, 2, 3, 4
	IV	Wolff, Fries, Stevens rearrangements	1	1, 2, 3, 4
9 th Week	I	Curtius, Lossen rearrangements	1	1, 2, 3, 4
	II	Baeyer-Villiger, Sommelet-Hauser rearrangements	1	1, 2, 3, 4
	III	Problems on rearrangement	1	1, 5, 6, 7
	IV	Retrosynthetic analysis: Disconnection approach, Synthons and synthetic equivalents	1	5, 6
10 th Week	I	Transform, Functional group interconversion, Umpolung, Chemo-, regio and stereoselectivities,	1	5, 6
	II	One group disconnection: Alcohols and carbonyl compounds	1	5, 6
	III	Two group disconnections: 1,2- difunctional compounds	1	5, 6
	IV	Two group disconnections: 1,3-difunctional compounds,	1	5, 6
11 th Week	I	Two group disconnections: 1,4-difunctional compounds,	1	5, 6
	II	Two group disconnections: 1,5-difunctional compounds,	1	5, 6
	III	Two group disconnections: 1,6-difunctional compounds,	1	5, 6
	IV	Diels-Alder reactions	1	5, 6
12 th Week	I	Robinson annulation	1	5, 6
	II	Michael addition	1	5, 6



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	III	Retrosynthetic analysis of longifolene	1	5, 6
	IV	Protecting groups in organic synthesis: Importance, Protection and deprotection of hydroxyl groups	1	7,8
13 th Week	I	MOM, MTM, SMOM and THP ethers	1	7,8
	II	Silyl ethers (TMS, TES, TIPS, TBDMS and TBDPS ethers)	1	7,8
	III	Protection for 1,2- and 1,3-diols	1	7,8
	IV	Protection and deprotection of carbonyl compounds: Acyclic and cyclic acetals and ketals	1	7,8
14 th Week	I	monothio and dithioacetals and ketals	1	7,8
	II	Monoprotection of dicarbonyl compounds,	1	7,8
	III	Protection of amines, Boc, Cbz, PMB as protecting groups	1	7,8
	IV	Bn, Ac, Bz and Ts as protecting groups	1	7,8
15 th Week	I	Common protecting groups for carboxylic acids and thiols	1	7,8
	II	Contd.	1	7,8
	III	Revision of Unit I	1	
	IV	Revision of Unit II	1	
16 th Week	I	Revision of Unit III	1	
	II	Revision of Unit IV	1	
	III	Revision of Unit V, Discussion of model question papers	1	
	IV	Discussion of model question papers	1	

REFERENCES

1. M. B. Smith and J. March, March's Advanced Organic Chemistry, 6th Ed., Wiley, New Jersey, 2007.
2. F. A. Carey and R. J. Sundberg, Advanced Organic Chemistry: Part A: Structure and Mechanisms, 5th Ed., Springer, New York, 2007.
3. J. Clayden, N. Greeves, S. Warren and P. Wothers, Organic Chemistry, Oxford University Press, Oxford, 2001.
4. J. McMurry, Organic Chemistry, 5th Ed., Brooks/Cole, New York, 2000.
5. S. Warren and P. Wyatt, Organic Synthesis: The Disconnection Approach, 2nd Ed., Wiley, 2008.
6. S. Warren and P. Wyatt, Organic Synthesis: Strategy and Control, Wiley, 2007.
7. Philip J. Kocienski, Protecting groups, 3rd Ed., Thieme, 2005.
8. P. G. M. Wuts and T. W. Greene, Greene's Protective Groups in Organic Synthesis, 4th Ed., Wiley, 2006.



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