

UNIVERSITY OF MADRAS
B.Sc. DEGREE COURSE IN CHEMISTRY
SYLLABUS WITH EFFECT FROM 2020-2021

BCY-DSC08

CORE-VIII: ORGANIC CHEMISTRY – I

Learning Outcomes

1. Understanding acidic nature of phenol and its properties
2. Learning the reactions of aldehydes and ketones
3. Learning the chemistry of carboxylic acids and their derivatives
4. Learning the chemistry of nitro compounds and amines
5. Learning the basics of green chemistry.

Semester	Subject Title	Total Hours	Credit
V	ORGANIC CHEMISTRY -I	60	4

UNIT-I: CHEMISTRY OF PHENOLS AND AROMATIC ALCOHOLS (12 hrs)

Phenols: Nomenclature, synthesis of phenol from benzene sulphonic acid, chlorobenzene and cumene - Properties - Acidity of phenols and substituted phenols (explanation on the basis of resonance stabilization). Reactions similar to those of alcohols, ring substitution in phenol- orientation of phenolic group towards electrophiles, halogenation, nitration and sulphonation, Libermann nitroso reaction, mechanism of Riemer-Tiemann reaction, Kolbe-Schmidt reaction and coupling with diazonium salts and condensation reactions. Alkylation and acylation of phenols.

Dihydric phenols and benzyl alcohols- preparation, properties and uses

UNIT-II: CHEMISTRY OF CARBONYL COMPOUNDS. (15 hrs)

Nomenclature, structure of carbonyl compounds, acidity of alpha-hydrogen atom, keto- enol tautomerism (proof for the two forms). Mechanism of nucleophilic addition with HCN, ROH, NaHSO₃, ammonia (NH₂OH, NH₂NH₂ and C₆H₅NHNH₂). Mechanism of Meerwein-Ponndorf-Verley reduction, Clemmenson reduction, Wolf-Kishner reduction, aldol condensation, Claisen-Schmidt reaction, Cannizaro reaction, haloform reaction, Perkin and Benzoin condensation reaction - Dieckmann condensation.

UNIT-III: CHEMISTRY OF CARBOXYLIC ACIDS AND THEIR DERIVATIVES (12 hrs)

Acidity of carboxylic acids, Effect of substituents on acidity, comparison of acid strengths of halogen substituted acetic acid and substituted benzoic acid.

Dicarboxylic acids: General methods of preparation - from alkyl cyanides, cyclic ketones and halo esters. Reactions - action of heat, action of PCl₅ and NH₃.

Acid derivatives (Aliphatic): Synthesis and important properties of acid derivatives (acid chlorides, acid anhydrides, esters and amides). Acetoacetic and malonic esters-Preparation and synthetic applications.

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UNIT-IV: CHEMISTRY OF NITROGEN COMPOUNDS (12hrs)

Nitrobenzene- preparation, reduction in different media, conversion of nitrobenzene to m- dinitrobenzene and TNT. Amines: Nomenclature, Basicity of amines, effect of substituents on basicity of aliphatic and aromatic amines. Preparation of primary amines by Gabriel synthesis and reduction of nitriles, secondary and tertiary amines-by the reduction of N-alkyl substituted amides. Reactions of amines-primary aliphatic and aromatic amines with nitrous acid, diazotization, coupling and carbylamines reactions.

UNIT - V: GREEN CHEMISTRY (9 hrs)

Concept and principles of green chemistry – need of green chemistry –Atom economy reactions (substitution, elimination, hydrogenation, addition and rearrangement reaction – basic concepts only)-green solvents-types and simple applications.

Green Catalysis – Heterogeneous – use of zeolites, silica, alumina, supported catalysis –bio catalysis: Enzymes, microbes, phase transfer catalysis (miscellar / surfactant).

Microwave, ultrasound and light promoted reactions (few examples for each type).

TEXT BOOKS

1. ArunBahl and Bahl B.S., A Text book of Organic Chemistry, S.Chand Publishing,2016.
2. Soni, P.L., and Chawla H.M., Text book of Organic Chemistry, 29thed., New Delhi, Sultan Chand & Sons, 2007.
3. Textbook of Organic Chemistry, C N Pillai, Universities Press Private Limited, Chennai,2010

REFERENCE BOOKS:

1. Jain M.K, Sharma S.C. Modern Organic Chemistry, Vishal Publishing Co.,2018
2. Morrison, R.T. and Boyd R.N., Organic Chemistry, 6thed., Pearson Education, Asia2002.
3. Environmental Chemistry with green chemistry by Asim.K.Das, Books and Allied Pvt. Ltd., Reprint 2015.
4. Graham Solomons T.W., Organic Chemistry, 3 rd ed., John Wiley & Sons.
5. Carey Francis A., Organic Chemistry , 7th ed., New Delhi, Tata McGraw Hill Education Pvt Ltd., 2009.
6. Finar I.L., Organic Chemistry, 6th, Vol.(1& 2), England, Wesley Longman Ltd.1996.
7. John E. McMurry, Organic Chemistry, 9th ed., Cengage Learning,2015.
8. Agarwal O.P., Organic Chemistry Reactions & Reagents, 49th ed., Goel Publishing House,2014.