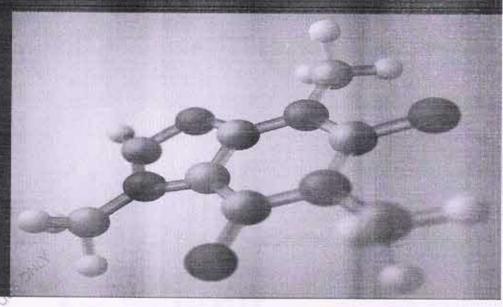
The authors are delighted to present "ORGANIC CHEMISTRY FOR DEGREE STUDENTS" in the hands of students. This book aims to help students not only to acquire a sound knowledge and understanding of organic chemistry, but also to make their study interesting and stimulating. We conceived the idea of writing this book with the objective to provide clarity on the concepts that will help students in their studies. The book is expected to make it easier for students to

Organic Chemistry For Degree Students



Chandrashekhar Malba Bhaskar Ankush /

Dr. Chandrashekhar Malba completed his PhD in Chemistry from University

Mr. Bhaskar Ankush is Pursuing PhD in Chemistry from S.R.T.M.U.

Dr. Vijaykumar More received Ph.D. degree in Chemistry from University of Salerno, Italy.

Authors are presently working as Assistant Professor in Rasika Mahavidyalaya, Deoni Dist, Latur IND.

> IQAC COORDINATOR Kal.Rasika Mahavidyalaya, Deoni Tq.Deoni Dist.Latur

De De geoni Dist

Tq. Deon! Dist. Latur



2020-



Vijaykumar More

# **Organic Chemistry**

For Degree Students

Imprint

Any brand names and product names mentioned in this book are subject to tradernark, brand or patent protection and are trademarks or registered tradernarks of their respective holders. The use of brand names, product names, common names, trade names, product descriptions etc. even without a particular marking in this work is in no way to be construed to mean that such names may be regarded as unrestricted in respect of trademark and brand protection legislation and could thus be used by anyone.

Cover image: www.ingimage.com

Publisher:

LAP LAMBERT Academic Publishing

is a trademark of

International Book Market Service Ltd., member of OmniScriptum Publishing Group

17 Meldrum Street, Beau Bassin 71504, Mauritius

Printed at: see last page ISBN: 978-620-0-78428-5

Copyright © Chandrashekhar Malba, Bhaskar Ankush, Vijaykumar More Copyright © 2020 International Book Market Service Ltd., member of OmniScriptum Publishing Group

EOR WITHORUSE O

#### CONTENTS

## Nomenclature of Organic Compounds

Functional groups and types of organic compounds, Basic rules of IUPAC Nomenclature, Nomenclature of mono and bi- functional compounds on the basis of priority order of following classes of organic compounds: alkanes, alkenes, alkynes, alcohols, ethers, aldehydes, ketones, carboxylic acid, carboxylic acid derivatives (acid halides, esters, anhydrides, amides), amines; Nomenclature of aromatic compounds: Mono, di and polysubstituted benzene (with not more than two functional groups)

#### 2. Basic Concepts in Organic Chemistry

Basic terms: Substrate and Reagents, types of reagents (Electrophilic and Nucleophilic). Notation of arrows: curved arrow, half headed arrow, double headed arrow, straight arrow. Bond fission: Homolytic and heterolytic fission. Reaction intermediates: Carbocation, Carbanion, Free radical, (Introduction, structure & Stability), carbone, nitrone & benzyne (only introduction). Electron mobility: Inductive effect (effect on acidic strength of alpha substituted acetic acid and α-chloroacetic acid), Mesomeric effect (Aniline and Nitrobenzene), Hyperconjugation (toluene).

#### 3. Alkanes Alkenes and alkynes

- 3.1 Alkanes: Introduction, Preparation of alkanes from a) Hydrolysis of Grignard reagent b) Kolbe's synthesis. Chemical reaction: a) Pyrolysis (mechanism), b) aromatization.
- 3.2 Alkenes: Introduction, Preparation methods a) But-1-ene from but-1-yne b) But-2ene from butan-2-ol. Chemical reactions with mechanism: a) Electrophilic addition of Br2 to ethene b) Electrophilic addition of HBr to propene c) Free radical addition of HBr to propene (Peroxide effect).
- 3.3 Alkynes: Introduction, Preparation of ethyne from a) Iodoform, b) Hydrolysis of calcium carbide. Chemical reactions: Electrophilic addition of HBr and Br to ethyne (with mechanism)

#### Cycloalkanes, Cycloalkenes and Dienes

4.1 Cycloalkanes: Introduction, Preparation of cycloalkanes from a) Adipic acid b) Aromatic hydrocarbon. Baeyer strain theory and Saches Mohr theory. Ring opening reaction with H2 and HI.

Kal.Rasika Mahavidyalaya, Deom ashka Mahavio Tq.Deoni Dist.Latur

- 4.2 Cycloalkenes: Introduction, preparation methods: a) Dehydration of cyclohexanol,
  b) Dehydrohalogenation of halocyclohexane. Chemical reactions: a) Epoxidation of cyclohexene, b) Allylic halogenations.
- 4.3 Dienes: Introduction, classification & Resonance structures. Preparation methods of 1,3-butadiene from a) 1,4-dibromobutane, b)1,4-butanediol. Chemical reactions: a) addition of Br<sub>2</sub> and HBr to 1,3-butadiene, b) addition of ethene to 1,3-butadiene (Diel's-Alder reaction).

# 5. Aromatic Hydrocarbons and Aromaticity

Introduction, Nomenclature, kekule and resonance structure of benzene, stability, Orbital picture of benzene. Aromaticity and antiaromaticity by Huckel's Rule (Benzene, Napthalene, Anthracene, Pyrrrole, Furan, Thiophene, Pyridine, Cyclopentadienyl cation and anion, Cyclopropenyl cation) Electrophilic Substitution reaction of benzene (with mechanism): Nitration, Halogenation, Friedel Craft alkylation and acylation. Orientation effect: Effect of activating and deactivating groups (-OH, NO<sub>2</sub>, CH<sub>3</sub>, Cl) on aromatic electrophilic (Nitration) substitution reaction (with mechanism)

#### 6. Phenols

Introduction, classification and acidic character of phenol (compare with ethanol).

Chemical reactions with mechanism: Reimer-Tiemann reaction, Acetylation, Fries rearrangement, Kolbe's carboxylation reaction.

# 7. Haloalkenes and Haloarenes

#### 7.1 Haloalkenes

- a) Vinyl Chloride: synthesis of vinyl chloride from 1) 1, 2- dichloroethane 2) ethene Chemical reactions; Addition reaction with HBr, polymerization reaction.
- b) Allyl Iodide: synthesis of allyl iodide from 1) allyl chloride 2) glycerol and HL Chemical reactions: reaction with NaOH, KCN, & Br<sub>2</sub>

# 7.2 Haloarenes:

Introduction, Synthesis of halobenzene from 1) Hunsdiecker reaction 2) Gattermann reaction. Chemical reactions (with mechanism): Ullamann biaryl

heavie,

IQAC-COORDINATOR Kal.Rasika Mahavidyalaya, Deoni

Tq.Deoni Dist.Latur

Prindipal Prindi

synthesis. Resonance & Relative reactivity of alkyl halides v/s vinyl and aryl halides towards nucleophilic substitution reactions.

#### 8. Carboxylic acid derivatives

#### 8.1 Acid Chlorides

Introduction, preparation methods: 1) From acetic acid and thionyl chloride, 2) From acetic acid and phosphorous pentachloride. Chemical reactions: (Hydrolysis, Action with alcohol, Action with amines).

## 8.2 Acid anhydrides

Introduction, preparation methods: 1) From acetyl chloride and carboxylic acid, 2) From acetyl chloride and sodium acetate. Chemical reactions: (Hydrolysis, Action with alcohol, Action with amines).

## 8.3 Esters

Introduction, preparation methods: 1) From ethyl alcohol and acetic acid, 2) From ethyl alcohol and acetyl chloride Chemical reactions: (Hydrolysis, Action of amines, Reduction).

#### 8.4 Amides

Introduction, preparation methods: 1) From ammonia and acetyl chloride 2) From ammonia and acetic anhydride. Chemical reaction: (Hydrolysis, Action of nitrous acid).

#### 9. Alcohols and epoxides

#### 9.1 Alcohols

Introduction and Classification

- a) Dihydric alcohol (ethylene glycol): Preparation methods: (Hydroxylation of alkene and From 1,2-dihaloalkane). Chemical reactions: [Reaction of ethylene glycol with, 1) Pb(OAC)<sub>4</sub>, 2) P<sub>2</sub>O<sub>3</sub>/ZnCl<sub>2</sub>J.
- b) Trihydric alcohol (Glycerol): Preparation methods from: 1) Oils and fats 2) Propene. Chemical reactions: [Reactions of glycerol with, 1) Nitric acid, 2) Acetyl chloride].

DI\* Kal. P.

9.2 Epoxides

Jaway 5

Kai Rasika Mahavidyalaya, Tq.Deoni Dist.Latur

Principal
Kel. Rasika Mahavidyalaya, Deoni
Tq. Deoni Dist. Latur

Introduction and nomenclature. Preparation methods: a) Oxidation of ethene in presence of Ag catalyst, b) Oxidation of ethene with per acetic acid. Chemical reactions: (Ring opening reactions of propylene oxide a) in acidic b) and basic medium/reagent.

Deoni Dist.

Principal
Principal
Rai. Rasika Mahavidyaiaya, Deoni
Tq. Deoni Diet. Latur

EOR AUTHOR USE ONLY

5