

Heterocyclic Chemistry

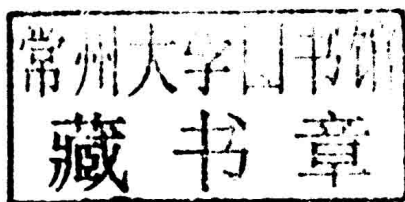


Alpha
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Heterocyclic Chemistry

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Alpha Science International Ltd.

Oxford, U.K.

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ALPHA SCIENCE INTERNATIONAL LTD.
7200 The Quorum, Oxford Business Park North
Garsington Road, Oxford OX4 2JZ, U.K.

www.alphasci.com

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ISBN 978-1-84265-709-6

Printed in India

Heterocyclic Chemistry

Preface

The book entitled 'Heterocyclic chemistry' meets the requirements of undergraduate and postgraduate students of chemistry. Chapter 1 deals with a brief introduction and the importance of heterocyclic compounds. Chapter 2 deals with the classification and nomenclature of heterocyclic compounds. Three membered heterocyclic compounds including the benzofused analogues are discussed in chapter 3. The four membered heterocyclic compounds are discussed in chapter 4. Five membered heterocyclic compounds containing one, two or more than two hetero atoms along with their benzofused analogues forms the subject matter of chapters 5, 6 and 7. Six membered heterocyclic compound with one or more than one hetero atoms along with their benzofused analogues are discussed in chapters 8 and 9. Chapter 10 deals with meso-ionic and seven membered heterocycles.

In all types of heterocycles, the methods of their synthesis, chemical reactions and their importance are given. It is hoped that the book will also be of immense value for students appearing in competitive examinations. Any suggestion will be gratefully acknowledged for the improvement of the book.

Finally, the author is grateful to Prof. J.M. Khurana and Prof. Sunita Malhotra for their help and advice. The help rendered by Mr. N.K. Mehra is gratefully acknowledged.

V.K. Ahluwalia

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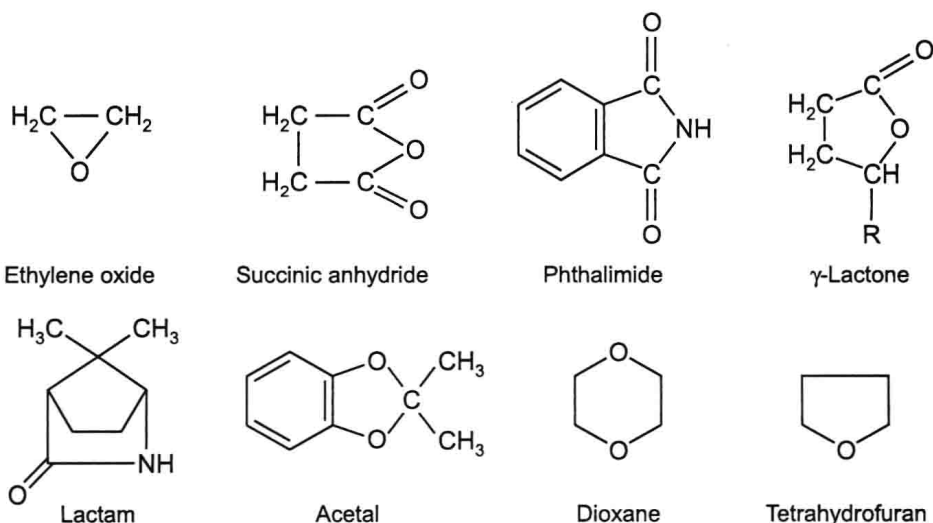
CHAPTER 1

Heterocyclic Chemistry

1.1 INTRODUCTION

It is well known that cyclic aromatic compounds are of two types. Homocyclic and heterocyclic compounds. In homocyclic compounds, the ring is made up to only one type of atom, carbon. Examples include benzene and its fused analogues etc. In heterocyclic compounds, besides carbon, other atoms like nitrogen, oxygen or sulphur are also present. However other hetero atoms like selenium, phosphorus, silicon, arsenic, boron etc may also be present. So a heterocyclic compound is one that contains a ring made up of more than one kind of atoms. The study of various aspects of, heterocyclic compounds is covered by the wider term 'Heterocyclic chemistry'.

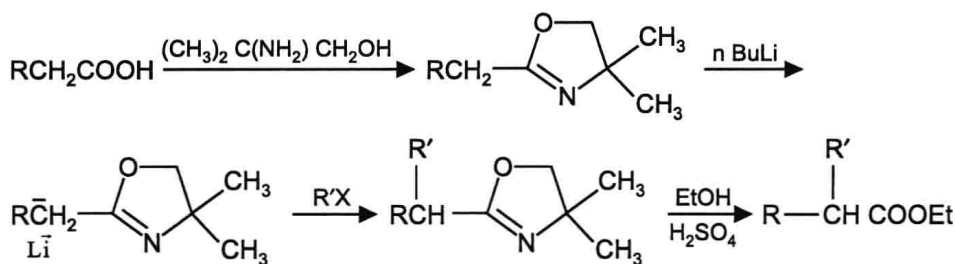
A large number of organic compounds which are heterocyclic according to the above definition are ethylene oxide, cyclic anhydrides, cyclic imides (lactones and lactams), cyclic acetals of dihydroxy alcohols are considered to be aromatic. Besides these, some of the solvents like dioxane and tetrahydrofuran are also heterocyclic compounds (Scheme-1). However in all the above cases the ring can be easily opened up to give open chain compounds.



Scheme-1

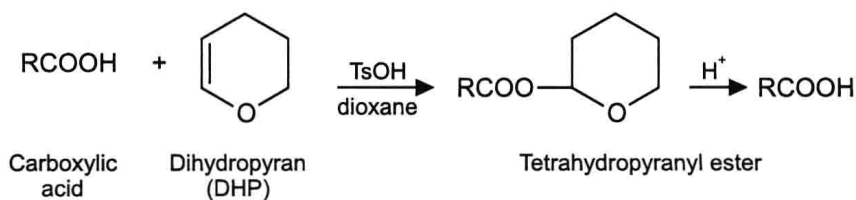
1.2 Heterocyclic Chemistry

In organic synthesis heterocyclic compounds are used as intermediates; after the synthesis is completed the heterocyclic moiety is removed. One such example is given below (Scheme-2).



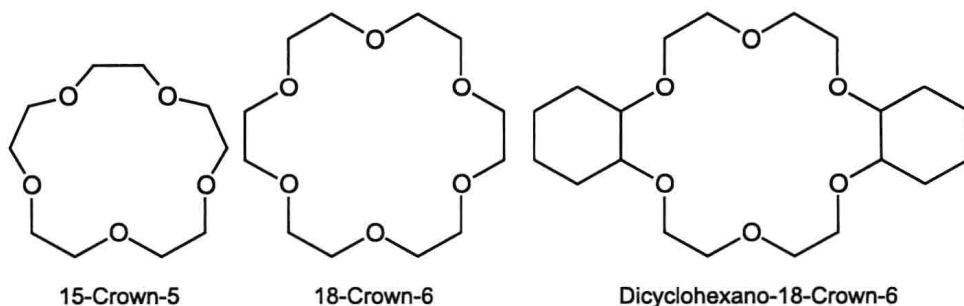
Scheme-2

Another example of the use of heterocyclic compounds in organic synthesis is the formation of tetrahydropyranyl ethers and esters, which are resistant towards alkali but can be easily cleaved by acids (Scheme-3).



Scheme-3

A group of cyclic polyethers are the crown ethers. These are large ring compounds containing several oxygen atoms, and are examples of heterocyclic compounds. (Scheme-4). These have the ability to solvate cations and are used in organic synthesis as phase transfer catalysts.



Scheme-4

A typical application of crown ethers is the oxidation of toluene with potassium permanganate in alkaline medium to yield benzoic acid in excellent yields (Scheme-5).