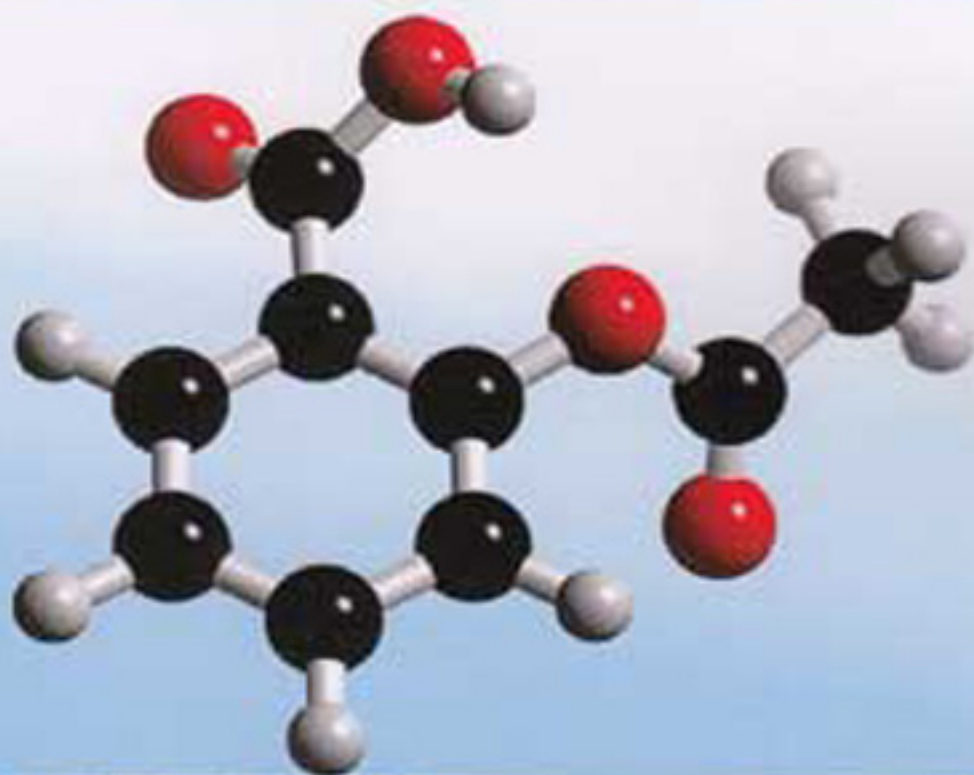


NOMENCLATURE OF ORGANIC AND MEDICINAL COMPOUNDS

SANJAY B. BARI
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Dedicated to...

All fellow professionals, our teachers, well wishers and Family members who encouraged and stood with us.

PREFACE

We have a great pleasure in presenting a book *Nomenclature of Organic and Medicinal Compounds*.

Compounds are frequently called by common or trade names, often because their IUPAC names may be long and complex, but the IUPAC name permits a chemist to know the structure of any compound based on the rules of the terminology, while the common name requires remembering what structure goes with what name. One of the purposes of the *Nomenclature of Organic and Medicinal Compounds* is to provide complete and comprehensive rules for nomenclature of organic and medicinal compounds easily, and to those in other fields, who need to deal with chemistry.

We have made sincere efforts to simplify the rules by giving number of examples. We are confident that the book will be useful for all chemistry students.

We owe our most sincere gratitude to Dr. Sanjay J Surana, Principal, R.C. Patel Institute of Pharmaceutical Education and Research, Shirpur and Management of Shirpur Education Society for their constant encouragement without which this book would not have reached the market.

We are thankful to Prof. S. B. Gokhale for his constant follow-up and co-operation in bringing out this book.

We take this opportunity to express our deep sense of gratitude towards all staff members of M/s Nirali Publication for their excellent co-operation.

Finally we must thank our family for their constant encouragement without which this book would not have been possible.

August 2014

Authors

The Salient Features of the Book...

- The book provides a complete and comprehensive rules of nomenclature of organic and medicinal compounds.
- Nomenclature of various organic and medicinal compounds, are explained in such a way that, it will be possible for the students to understand the rules easily.
- This will help students to give systematic and scientific name to any organic and medicinal compound easily.

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INTRODUCTION TO NOMENCLATURE

In early days of organic chemistry, each new compound was given an individual name. Such name was based on the source, some property or some other trivial reason. Thus formic acid, HCOOH, was named as it was obtained by distillation of red ants (Latin, *Formica* = ants). A group of sedatives was named barbiturates after the name of women Barbara. The structures of many of these compounds were not known at that time. An ordinary name given to a compound without reference to its structure is called a **Common Name** or **Trivial Name** which are commonly used and recognized. Some examples are:

Name	Formula
Methane	CH ₄
Butane	C ₄ H ₁₀
Acetone	CH ₃ COCH ₃
Toluene	CH ₃ C ₆ H ₅
Acetylene	CH ₂ CH ₂
Ethyl alcohol	C ₂ H ₅ OH

1.1 IUPAC SYSTEM OF NOMENCLATURE

Organic chemistry is the chemistry of carbon compounds. Carbon has the ability to form long chains and due to this millions of compounds from simple hydrocarbons to large biomolecules such as proteins, lipids, carbohydrates, and nucleic acids are formed. With more than 26 million organic compounds now known and several thousand more being created daily, naming them all is a real problem. In organic chemistry, confusion can arise because of the variety of names that have been applied to compounds; common names, trade names and systematic names are widespread. For example, a compound of formula, C₆H₆O has variously been known as phenol, carboic acid, phenyl hydroxide, hydroxybenzene, phenylic acid and oxobenzene. To eliminate the production of many names for a compound, a systematic naming system has been derived to uniquely name the several million organic different compounds based on considerations of their structure. This systematic naming system is referred to as its IUPAC System. (IUPAC is pronounced as eye-you-pack).

The IUPAC nomenclature is a systematic method of naming organic chemical compounds as recommended by the **International Union of Pure and Applied Chemistry** (IUPAC) in 1957. Ideally,

every organic compound should have a name from which an unmistakable structural formula can be drawn. The main idea of IUPAC nomenclature is that every compound has one and only one name, and every name corresponds to only one structure of molecules (i.e. a one-one relationship), thereby reducing uncertainty.

There are two parts to every organic compounds name in IUPAC system:

Substituent-Parent

Parent tell us how many carbon atoms are found in the longest chain, while substituent indicate any groups that are attached to the longest carbon chain.

Knowing these rules and given a structural formula, one should be able to write a unique name for every individual compound. Likewise, given IUPAC name, one should be able to write a structural formula.

1.2 TYPE(S) OF NOMENCLATURE OPERATIONS

The operations described in this section all involve structural modifications, and are classified according to the type of modification. The structures to which the various modifications are applied can be regarded as parent structures, the modifications are expressed by suffixes, affixes, infixes and prefixes, or by a change of the endings. Substitutive nomenclature, in general, is preferred because of its broad applicability, but radicofunctional, additive, and replacement nomenclature systems are convenient in certain situations.

1.2.1 The substitutive operation

1.2.2 The replacement operation

1.2.3 The additive operation

1.2.4 The subtractive operation

1.2.5 The conjunctive operation

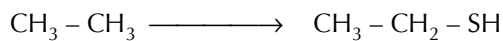
1.2.6 The multiplicative operation

1.2.7 The fusion operation

1.2.1 The Substitutive Operation

The substitutive operation is the operation most extensively used in organic nomenclature. The substitutive operation involves the exchange of one or more hydrogen atoms for another atom or group of atoms. This process is expressed by a suffix or a prefix denoting the atom or group being introduced.

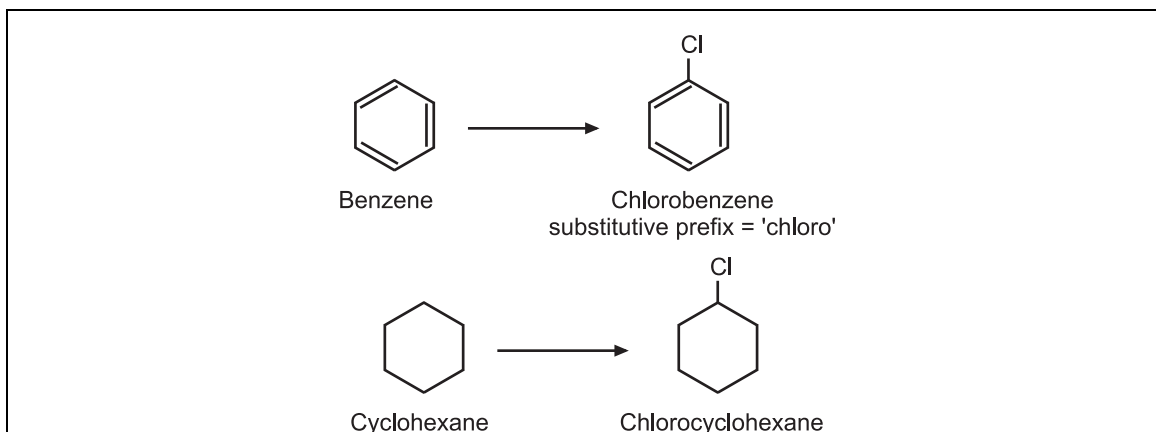
Examples :



Ethane

Ethanethiol

(Substitutive suffix = 'thiol')



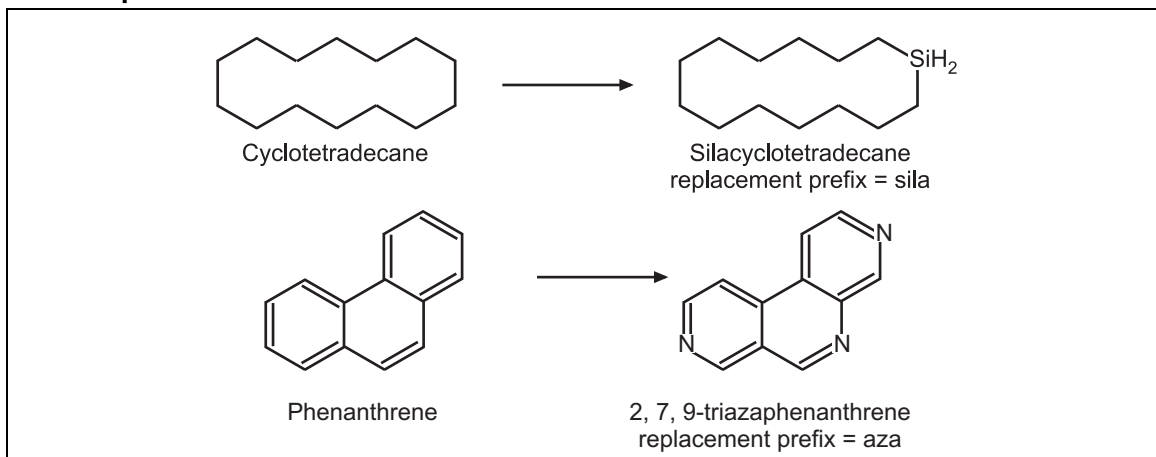
1.2.2 The Replacement Operation

The replacement operation can be used for naming organic compounds in which skeletal atoms of parent structure are replaced by other skeletal atoms, or in which oxygen atom and/or hydroxyl groups of characteristic groups are replaced by other atoms or groups. The replacement operation involves the exchange of one group of atom or a single non hydrogen atom for another. This can be expressed in several ways, as shown in the following subsections.

1.2.2.1

By replacement ('a') prefixes that represent the element being introduced. This type of replacement is called 'skeletal replacement'. The most important type in the nomenclature of organic compounds is replacement of carbon atoms by O, S, Se, Te, N, P, As, Sb, Bi, Si, Ge, Sn, Pb, B, Al, Ga, In, or Tl.

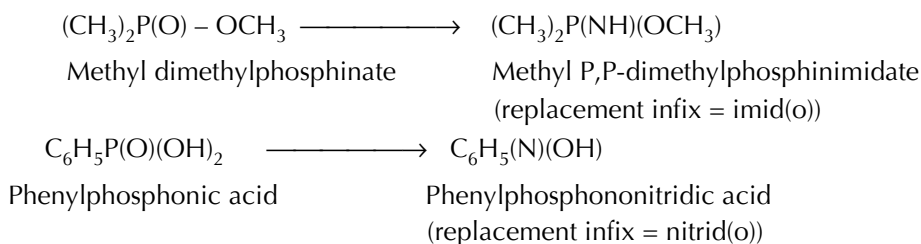
Examples :



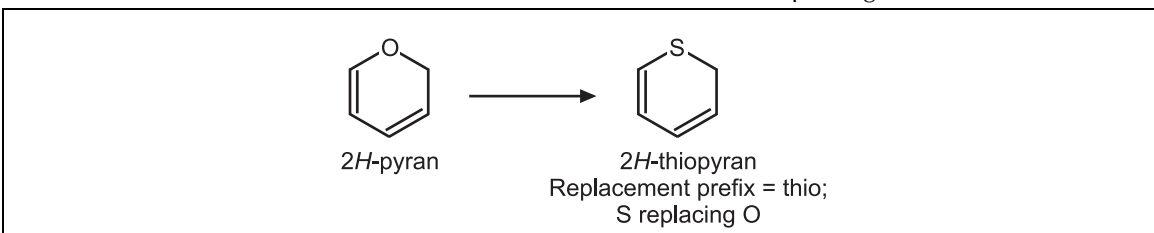
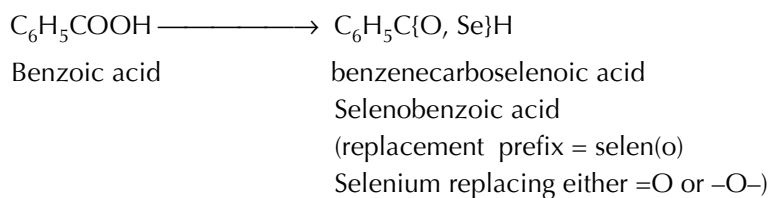
1.2.2.2

By prefixes or infixes signifying replacement of oxygen atoms or oxygen-containing groups. This type of replacement is called 'functional replacement'. The affixes represent the group(s) being

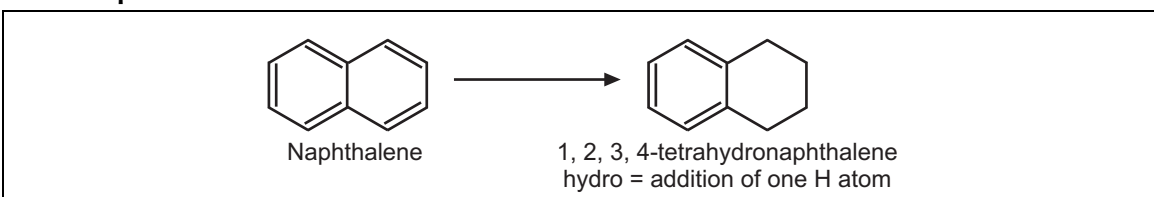
introduced. Functional replacement nomenclature is a method by which oxygen atoms of characteristic groups and in functional parent compounds are replaced by halogen, chalcogen and/or nitrogen atoms. The replacement of oxygen atoms or hydroxy groups by other atoms or groups can be described by prefixes attached to, or infixes inserted into, names of characteristic groups, parent hydrides and functional parent compounds having retained or systematic names.

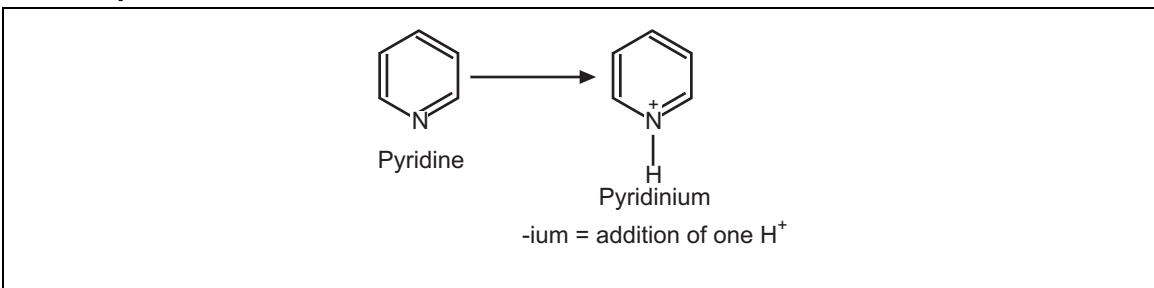
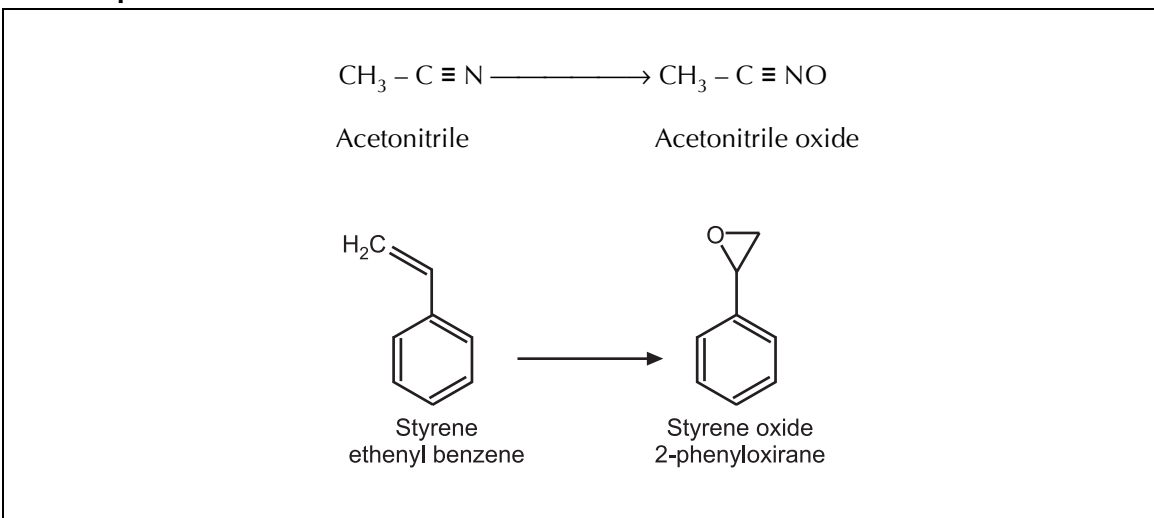
Examples :

The affixes 'thio', 'seleno', and 'telluro' indicate replacement of an oxygen atom of a characteristic group by another chalcogen atom.

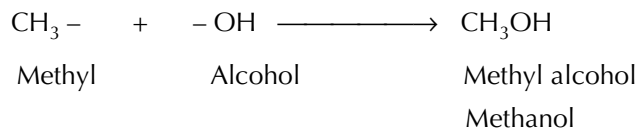
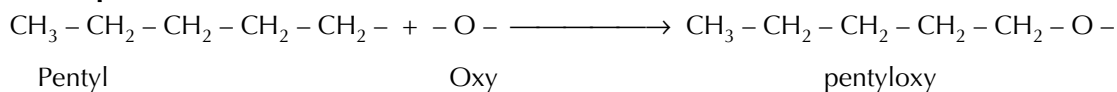
Examples :**1.2.3 The Additive Operation**

The additive operation involves the formal assembly of a structure from its component parts without loss of any atoms or groups. This operation can be expressed in several ways, as shown in the following subsections.

1.2.3.1 By use of an additive prefix**Example :**

1.2.3.2 By use of an additive suffix**Example :****1.2.3.3** By the use of separate word**1.2.3.3.1** With the name of a neutral parent structure**Examples :****1.2.3.3.2** With one or more substituent prefix name(s)

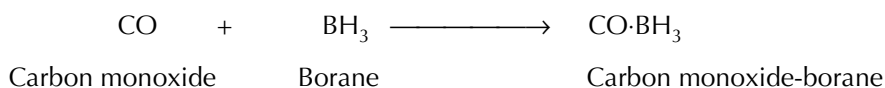
Here the separate word is a class or subclass name representing the characteristic group or the kind of characteristic group to which the substituents are linked.

Example :**1.2.3.3.3** By adding substituent groups, in an operation called 'concatenation'.**Example :**

1.2.3.3.4 By adding molecular entities together

Chemical species AB in which two molecular entities A and B are combined directly with no loss of atoms from either A or B can be named by citing the names of A and B linked with an 'em' dash.

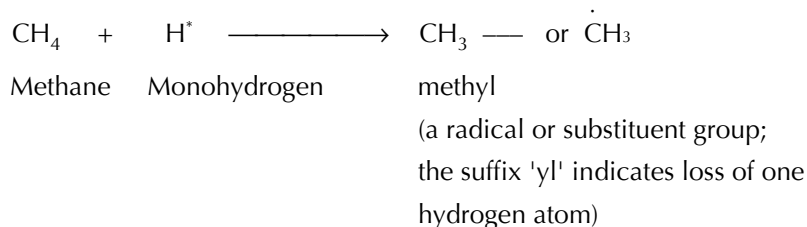
Example :

**1.2.4 The Subtractive Operation**

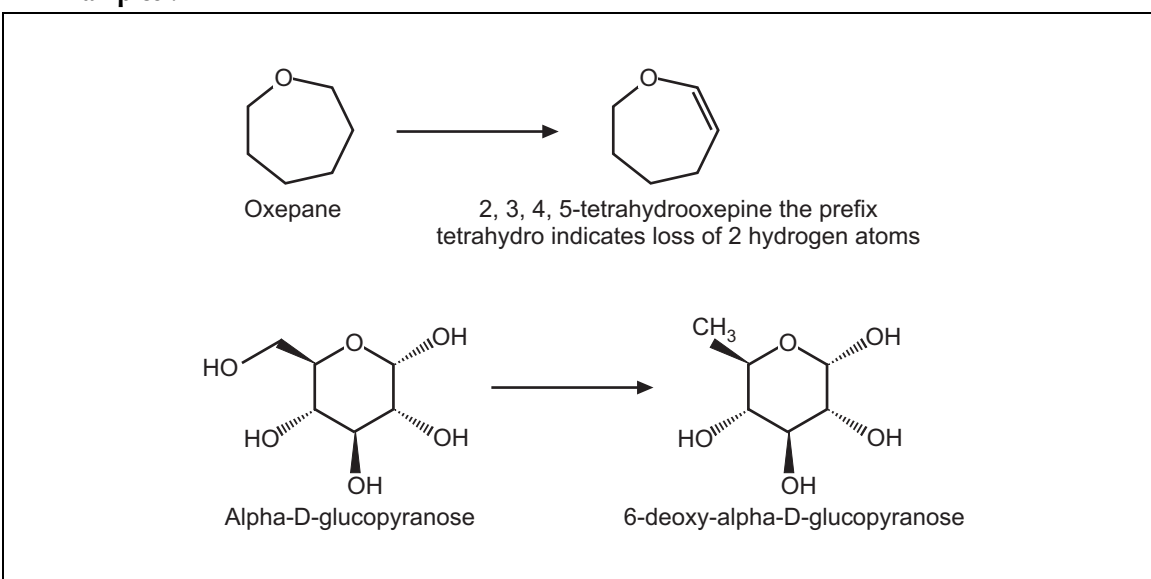
The subtractive operation involves the removal of an atom or group embedded in a name. This operation can occur with no other change, with the introduction of unsaturation, or with the formation of substituent groups, radicals, or ions. Several prefixes are used to indicate subtractive operations of many kinds of natural products. Subtraction can be expressed in several ways as shown in the following subsections.

1.2.4.1 By suffix

Examples :

**1.2.4.2 By prefix**

Examples :



Nomenclature Of Organic & Medicinal Compounds



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