

Chemistry Study Materials for Class 11

(NCERT Based Notes of Chapter- 12)

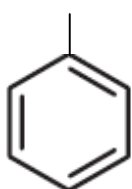
Ganesh Kumar Date: -09/01/2021

SOME BASIC PRINCIPLES AND TECHNIQUES

Nomenclature of Substituted Benzene Compounds

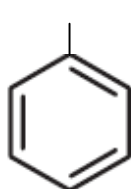
For IUPAC nomenclature of substituted benzene compounds, the substituent is placed as prefix to the word benzene. But common names of some compounds are accepted by IUPAC.

NO₂



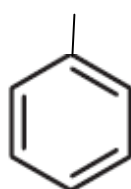
Nitrobenzene

Cl



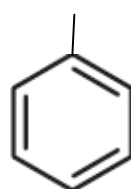
Chlorobenzene

Br



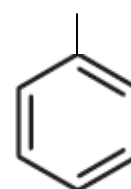
Bromobenzene

CHO



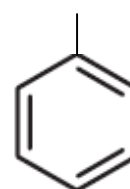
Benzaldehyde

COOH



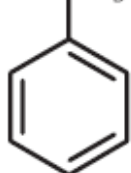
Benzoic acid

OH



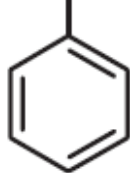
Phenol

CH₃



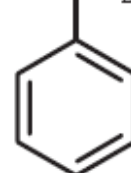
Methylbenzene
(Toluene)

OMe



Methoxybenzene
(Anisole)

NH₂

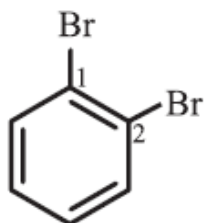


Aminobenzene
(Aniline)

Nomenclature of di or polysubstituted benzene

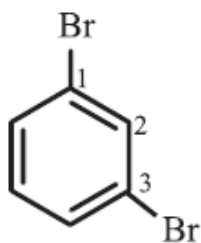
If benzene ring is disubstituted, the position of substituents is indicated by numbering the carbon atoms of the ring such that the substituents get the lowest possible numbers.

Example – Dibromobenzene



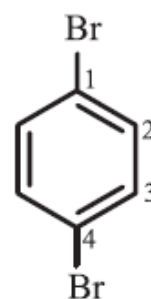
(a)

1,2-Dibromobenzene



(b)

1,3-Dibromobenzene



(c)

1,4-Dibromobenzene

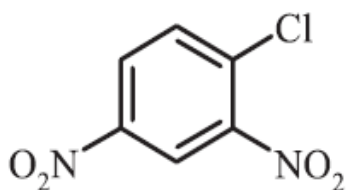
In the common system of nomenclature the terms ortho (o), meta (m) and para (p) are used as prefixes to indicate the relative positions 1,2- 1,3- and 1,4- respectively.

So 1, 2-dibromobenzene is named as ortho (or just o-) dibromobenzene, 1,3-dibromobenzene as meta (or just m-) dibromobenzene and 1,4-dibromobenzene as para (or just p-)dibromobenzene.

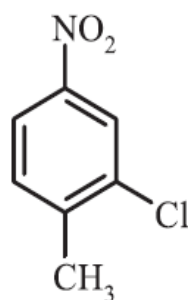
For tri- or higher substituted benzene derivatives, these prefixes cannot be used and the compounds are named by identifying substituent positions on the ring by following the lowest locant rule. In some cases, common name of benzene derivatives is taken as the base compound. Substituent of the base compound is assigned number 1 and then the direction of numbering is chosen such that the next substituent gets the lowest number. The substituents are named in alphabetical order.

Some examples

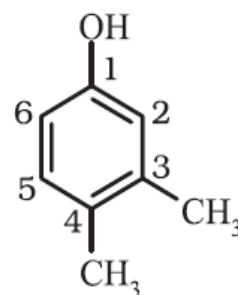
are:



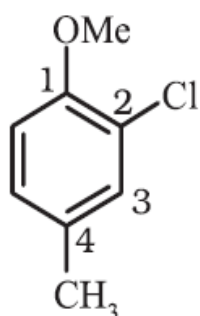
1-Chloro-2,4-dinitrobenzene



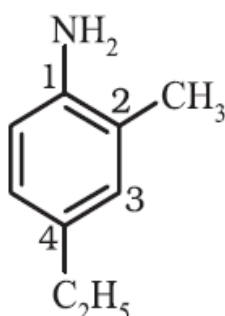
2-Chloro-1-methyl-4-nitrobenzene



3,4-Dimethylphenol



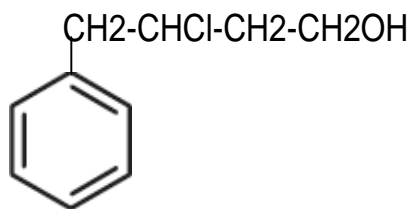
2-Chloro-4-methylanisole



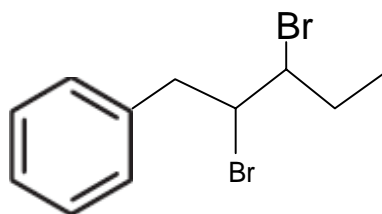
4-Ethyl-2-methylaniline

When a benzene ring is attached to an alkane with a functional group, it is considered as substituent, instead of a parent. The name for benzene as substituent is phenyl (C_6H_5- , also abbreviated as Ph).

Example:



3-Chloro-4-phenyl-1-butanol



2,3-Dibromo-1-phenylpentane

Isomerism

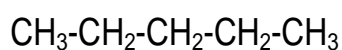
The phenomenon of existence of two or more compounds having the same molecular formula but different structural formula or spatial arrangement of atoms is known as isomerism. Such compounds are called as isomers. Isomers have different physical and chemical properties. Isomerism can be broadly classified into two – structural isomerism and stereo isomerism.

1. Structural isomerism

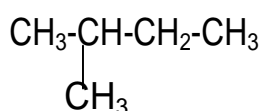
Compounds having same molecular formula but different structural formula (arrangement of atoms) are called structural isomers and the phenomenon is called structural isomerism. There are mainly four types of structural isomerism:

a) **Chain Isomerism:** Isomers differ in carbon chain or skeleton are called chain isomers and the phenomenon is called chain isomerism.

E.g.: Pentane (C_5H_{12})

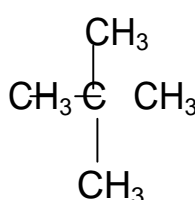


n-pentane



Isopentane

(2-Methylbutane)



Neopentane

(2,2-Dimethylpropane)

b) **Position isomerism:** Isomers which differ in the position of the substituent or side chain are called position isomers and the phenomenon is called position isomerism.

E.g. : Alcohol with molecular formula $C_4H_{10}O$ may be 1-butanol or 2-butanol



1-Butanol

2-Butanol

c) **Functional group isomerism:** Isomers which differ in the functional group are called functional group isomers and the phenomenon is called functional group isomerism. This isomerism is shown by alcohols and ethers and aldehydes and ketones.

E.g. compound with the molecular formula C_2H_6O may be an alcohol ethanol (CH_3-CH_2OH) or an ether Methoxy methane (CH_3-O-CH_3).

d) **Metamerism:** Isomers which differ in the carbon chain (alkyl groups) around the functional group are called metamers and the phenomenon is called metamerism. It is commonly shown by ethers.

E.g.: Ether with molecular formula $C_5H_{12}O$ may be methoxybutane ($CH_3-O-CH_2-CH_2-CH_2-CH_3$) or ethoxypropane ($CH_3-CH_2-O-CH_2-CH_2-CH_3$).

2. Stereo isomerism

Compounds having same molecular formula but different spatial arrangement of atoms are called stereo isomers and the phenomenon is called stereoisomerism. They have same atom to atom bond.

There are two types of stereo isomerism – *Geometrical isomerism* and *Optical isomerism*. The diagrammatic representation of different types of isomerism is:

