

Al-Mustaqbal University College

Department of Medical Laboratory Techniques

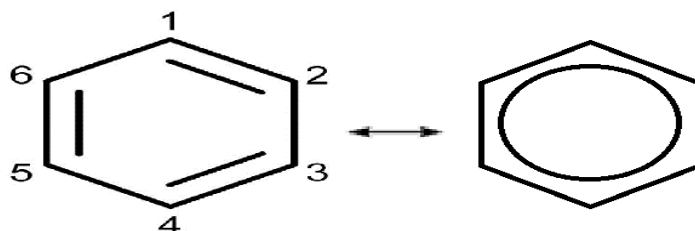
Subject :- General Chemistry (1) Part(B)

lecture (7)

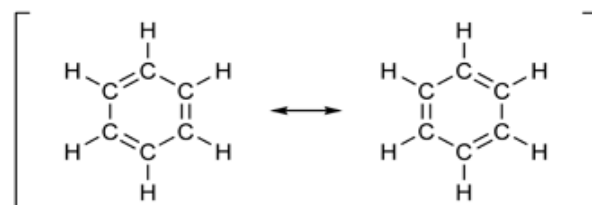
Course Instructor :- Assist.prof. Dr.Thamer A.A. Alalwani

Aromatic compounds

All aromatic compounds are based on benzene, C_6H_6 , which has a ring of six carbon atoms with alternate double and single bonds structure, each carbon atom having one hydrogen atom attached. Some chemists replace these structures for benzene and its derivatives with a ring having a circle in the center.



Kekulé suggested that the position of double and single bonds could change producing two structures that represent benzene:

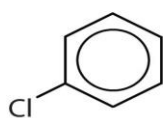


Others prefer to represent benzene by drawing just one of the alternating double and single bonds structures.

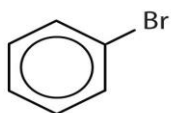
THE NAMES OF AROMATIC COMPOUNDS

The phenyl group. Remember that you get a methyl group, CH_3 by removing a hydrogen from, methane, CH_4 . You get a phenyl group, C_6H_5 , by removing a hydrogen from a benzene ring, C_6H_6 . Like a methyl or an ethyl group, a phenyl group is always attached to something else.

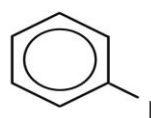
These compounds are named in the usual way with the group that replaces a hydrogen atom named as a substituent group: Cl as Chloro, Br as Bromo, I as Iodo, NO_2 as nitro, and CH_3CH_2 as ethyl.



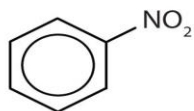
Chlorobenzene



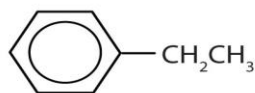
Bromobenzene



Iodobenzene

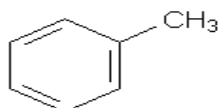


Nitrobenzene

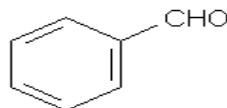


Ethylbenzene

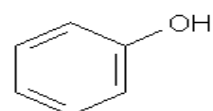
Some are more frequently denoted by common names. For example, methylbenzene is always known as toluene, hydroxybenzene, as phenol. The most important of these compounds are the following:



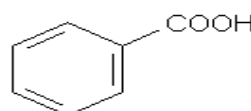
toluene



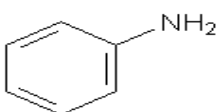
benzaldehyde



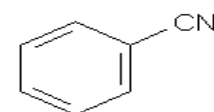
phenol



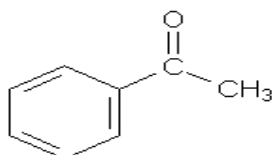
benzoic acid



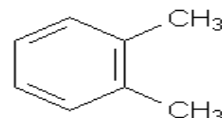
aniline



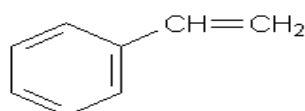
benzonitrile



acetophenone

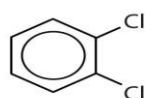


ortho-xylene

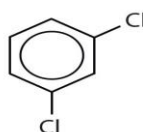


styrene

When there is more than one group attached to the benzene ring, the name must not only tell what group are present, but also where they are located. There are three possible disubstituted benzenes. We can distinguish the three possible isomers in two ways. The first is by use prefixes *ortho-*, *meta-*, and *para-*, which are abbreviated *o,m*, and *p*. The second is to number the carbon of the benzene ring. For example:



1,2-dichlorobenzene
o-dichlorobenzene

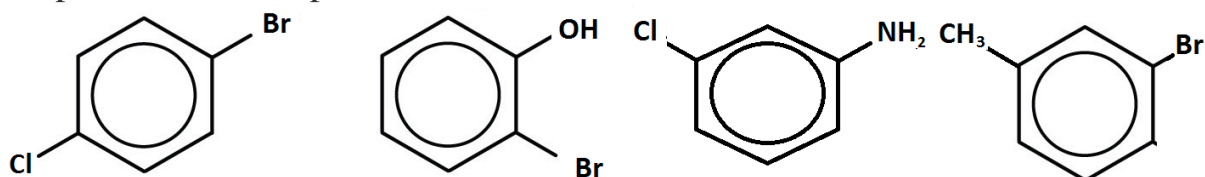


1,3-dichlorobenzene
m-dichlorobenzene



1,4-dichlorobenzene
p-dichlorobenzene

If the two groups are different and one of the groups is the kind that gives a special name to the molecule, then it is named as derivative of that special compound. For example:



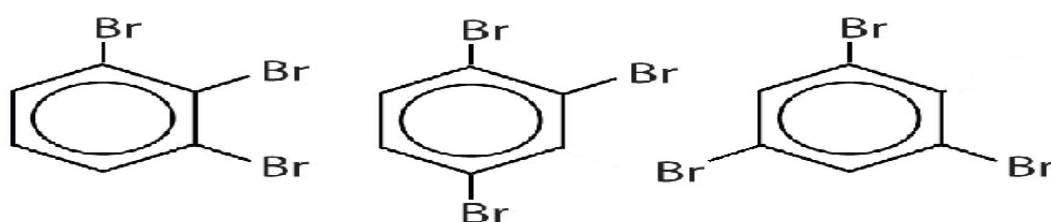
1-Bromo-4-chlorobenzene
p-Bromochlorobenzene

2-Bromophenol
O-Bromophenol

3-Chloroaniline
m-Chloroaniline

3-Bromotoluene
m-Bromotoluenen

If the three groups are same give three isomer

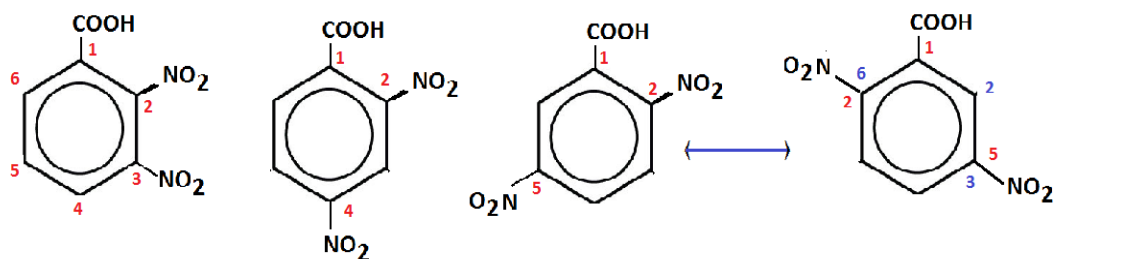


1,2,3-Tribromobenzene

1,2,4-Tribromobenzene

1,3,5-Tribromobenzene

But if the three groups tow same and one deferent give (6) isomer

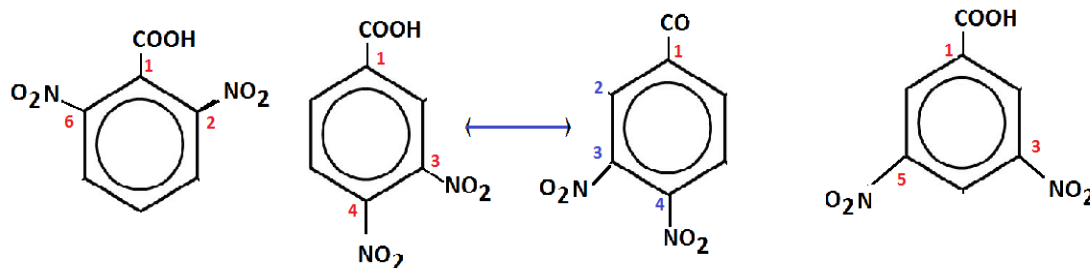


2,3- dinitrobenzoic acids

2,4- dinitrobenzoic acids

2,5- dinitrobenzoic acids

2,5- dinitrobenzoic acids same 3,6- dinitrobenzoic acids

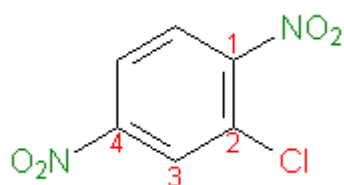


2,6- dinitrobenzoic acids

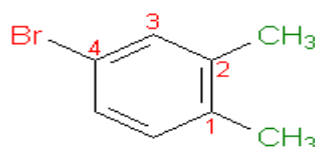
3,4- dinitrobenzoic acids

3,5- dinitrobenzoic acids

For benzene rings with multiple substituents, the ring atoms are numbered to minimize the numbering of the substituents groups , alternatively, *ortho*/*meta*/*para* nomenclature can be used for disubstituted rings



2-Chloro-1,4-dinitrobenzene

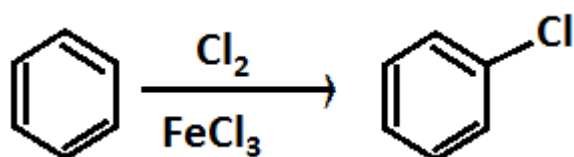


4-Bromo-1,2-dimethylbenzene

Reactions of aromatic compounds

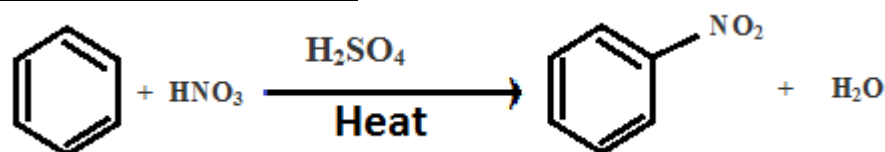
The most common reactions of the benzene ring involves substituting one or more of the ring hydrogen by other groups or atoms. The following reaction are typical examples of such reactions:

1-Halogenation of benzene:-

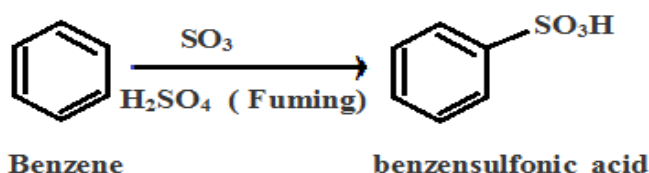


Br₂ and FeBr₃ will make bromobenzene and Fe may be used instead of FeX₃.

2- Nitration of Benzene

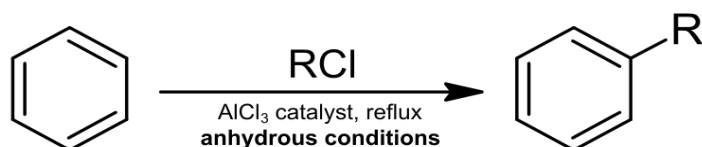


3-Sulfonation of Benzene:-



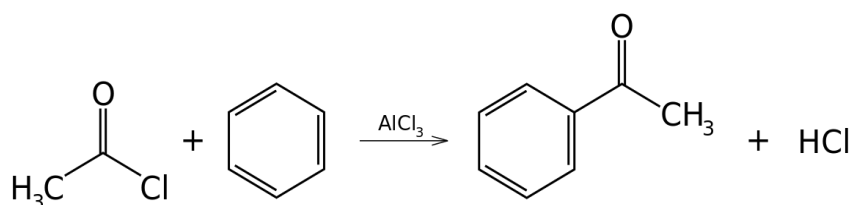
4-Friedel-Crafts alkylation

Alkylation is the transfer of an **alkyl** group from one molecule to another.



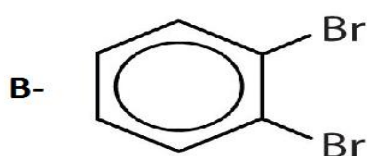
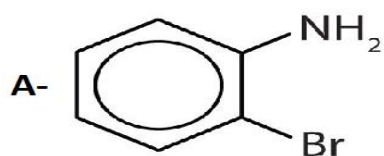
5- Friedel-Crafts acylation:-

acylation is the process of adding an **acyl** group to a compound.



Question:-

Q.1// Name each compound using both the common name and the IUPAC name.



Q.2// How many isomeric dibromobenzenes exist? A) none B) 1 C) 2 D) 3

Q.3// How many isomeric dinitrobenzoic acids can exist? $\text{C}_6\text{H}_3(\text{NO}_2)_2\text{CO}_2\text{H}$
 A) 3 B) 4 C) 5 D) 6

Q4// Which of the following is phenol?

A) $\text{C}_6\text{H}_5\text{OH}$ B) $\text{C}_6\text{H}_5\text{CH}_2\text{OH}$ C) $\text{C}_6\text{H}_5\text{COCH}_3$ D) $\text{C}_6\text{H}_5\text{OCH}_3$