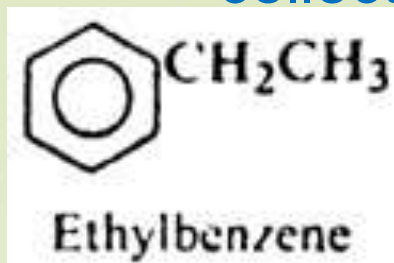




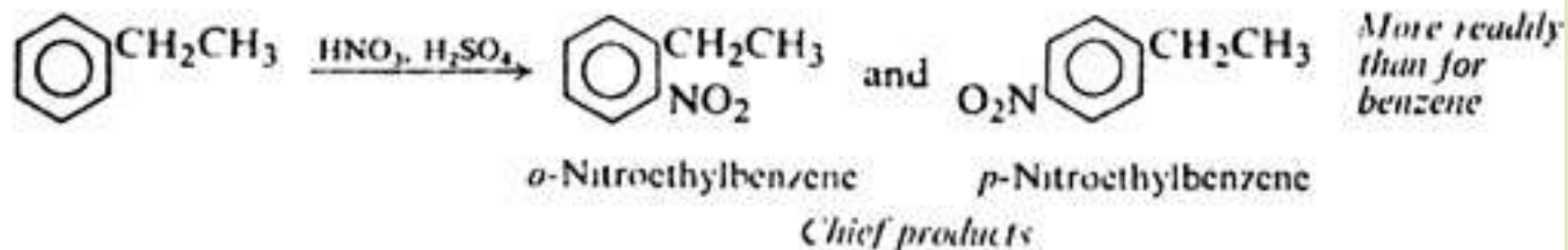
Arenes

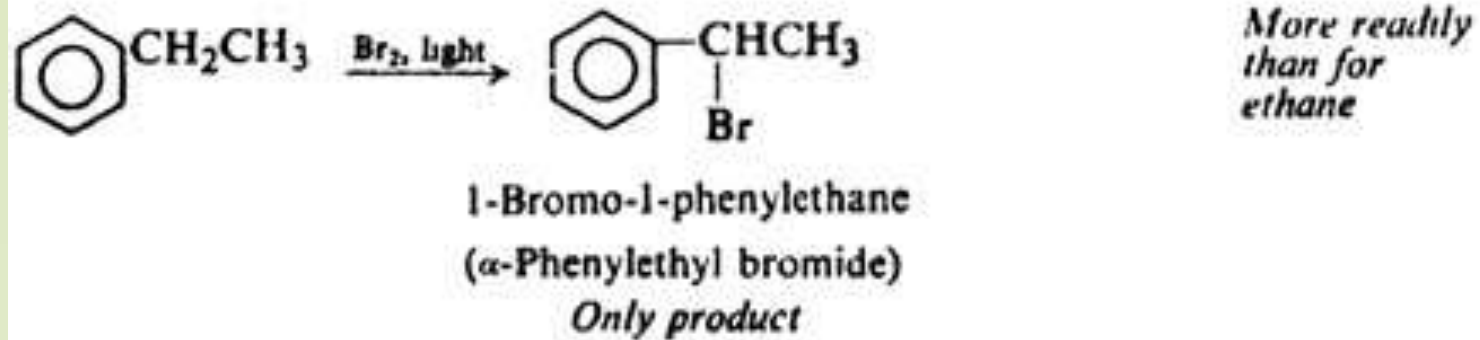
Aliphatic-aromatic hydrocarbons ➤

Important compounds are contain both aliphatic and ❖ aromatic units; hydrocarbons of this kind are known collectively as **arenes** for example:



The ring of ethylbenzene should undergo the electrophilic ❖ substitution characteristic of benzene, and the side chain should undergo the free radical substitution characteristic of ethane

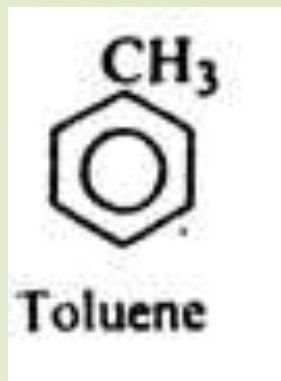




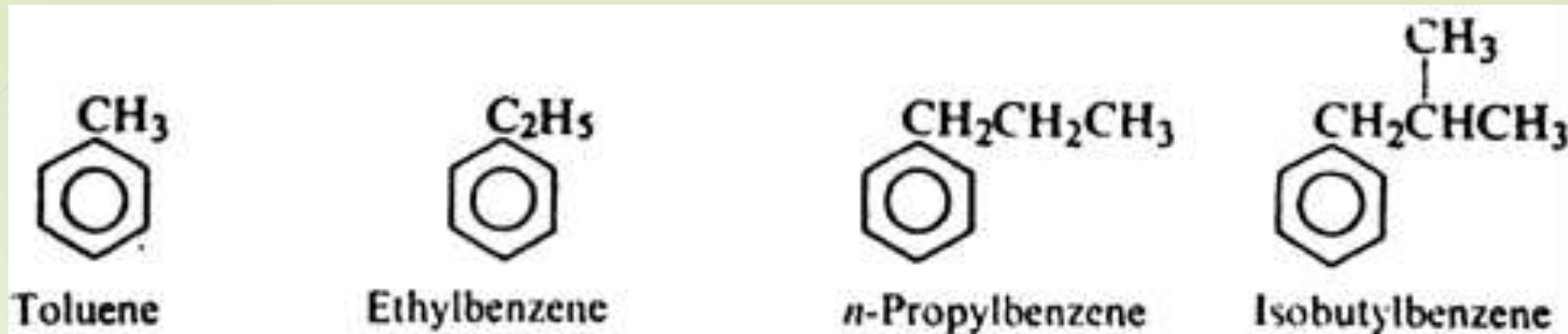
Thus each portion of the molecule affects the reactivity of the other portion and determines the orientation of attack ❖

Structure and nomenclature ➤

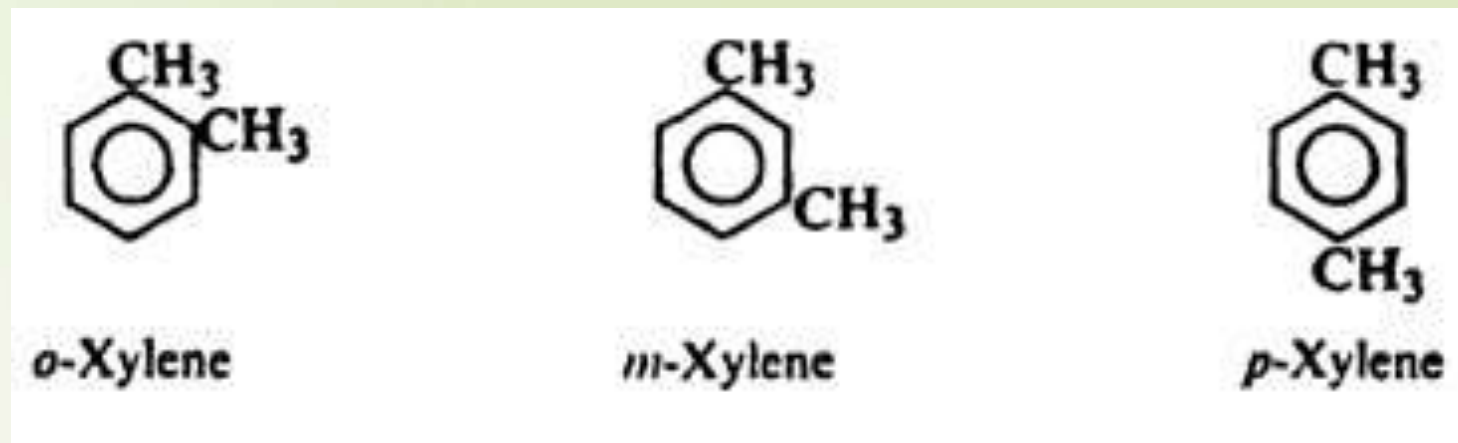
is methylbenzene, alkylbenzenes, the simplest of them given the special name of toluene ❖



Compounds containing longer side chains are named ❖
by prefixing the name of the alkyl group to the word - benzene



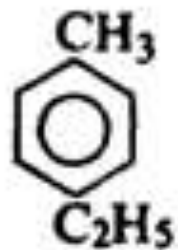
❖ The simplest of the dialkylbenzenes, the dimethylbenzenes, are given the special names of xylenes



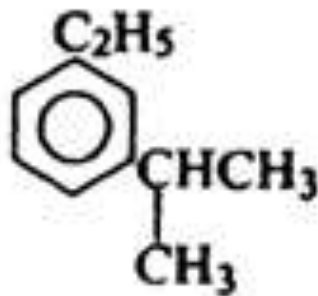
are group methylene containing Dialkylbenzenes ❖
named as derivatives of toluene

Others are named by prefixing the names of both alkyl ❖
groups to the word -benzene

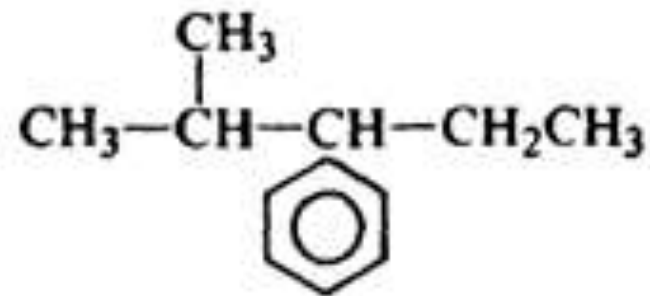
chain side complicated very a containing A compound ❖
might be named as a phenylalkane ($C_6H_5 =$ phenyl)



p-Ethyltoluene

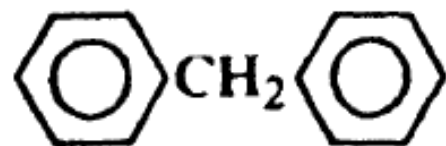


m-Ethylisopropylbenzene

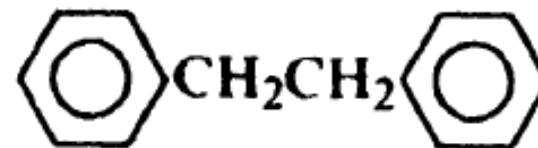


2-Methyl-3-phenylpentane

Compounds containing more than one benzene ring are ❖
nearly always named as derivatives of alkanes



Diphenylmethane

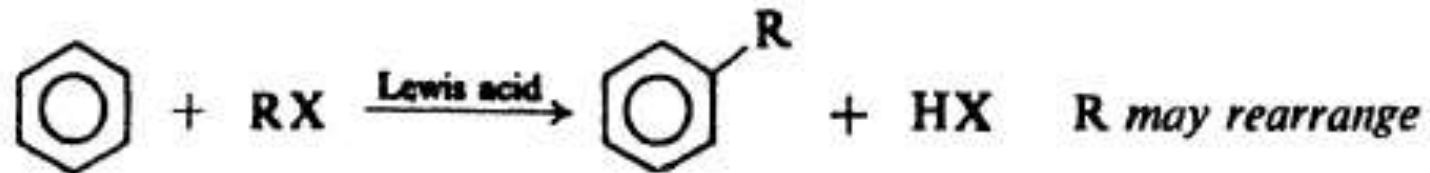


1,2-Diphenylethane

The simplest ❖ has alkenylbenzene names special the
Others styrene. substituted as named generally are
substituted as occasionally alkenes, benzenes.
Alkynylbenzenes are named as substituted alkynes

Preparation of alkylbenzenes ➤

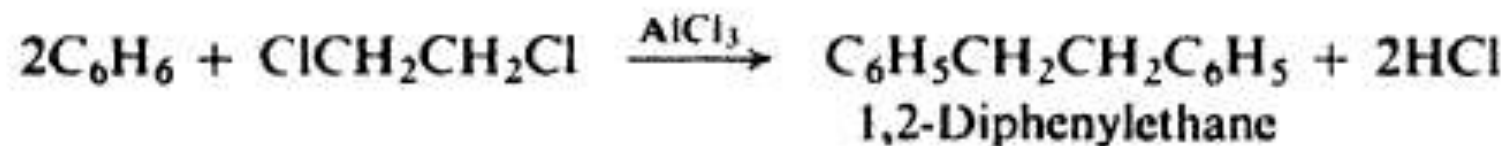
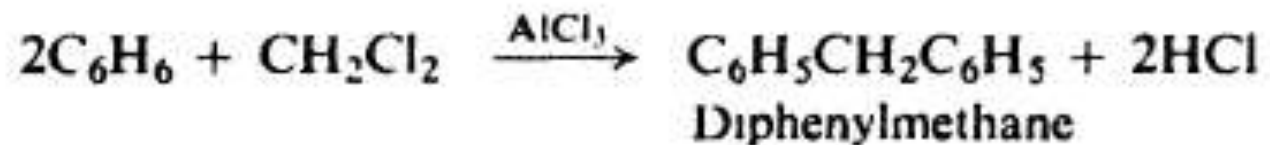
1. Attachment of alkyl group: Friedel-Crafts alkylation.

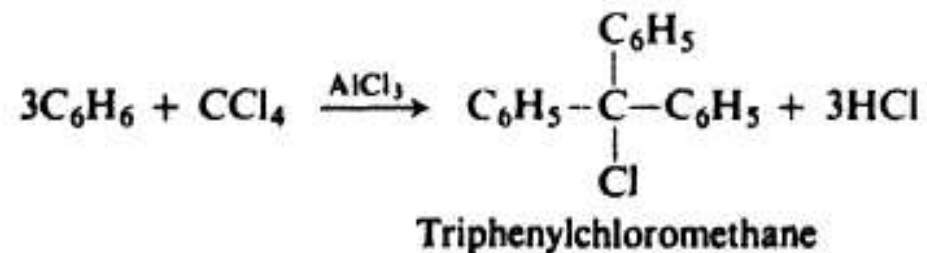
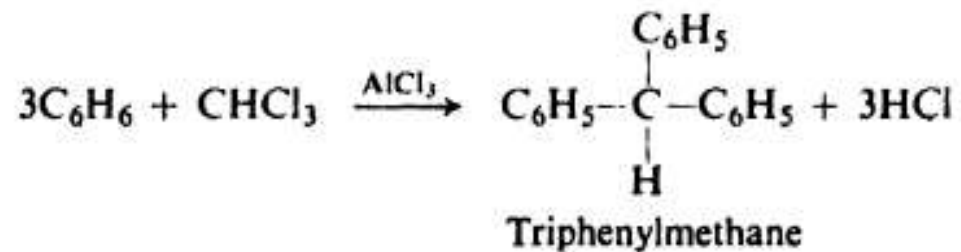


Lewis acid: AlCl_3 , BF_3 , HF , etc.

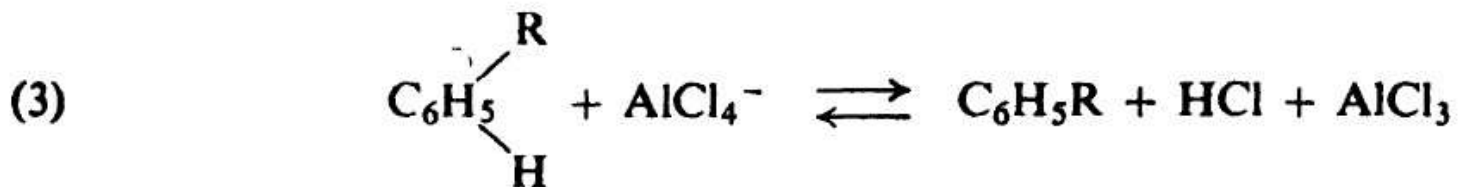
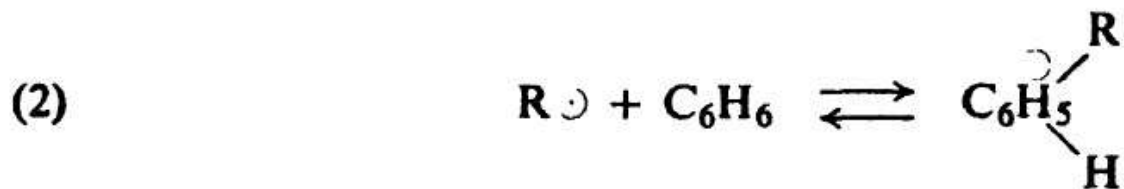
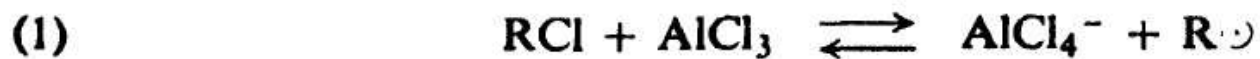
Ar-X cannot be used in place of R-X

prepare to possible is it alkanes polyhalogenated ❖
compounds containing more than one aromatic ring

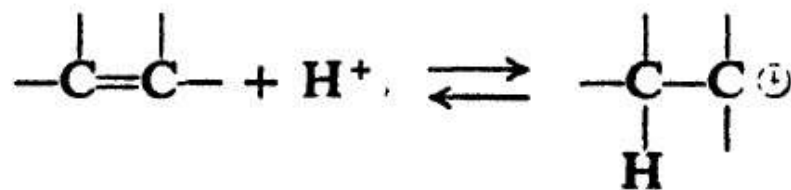




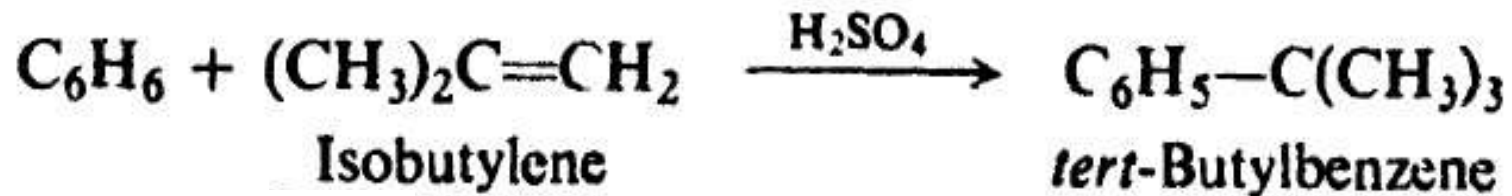
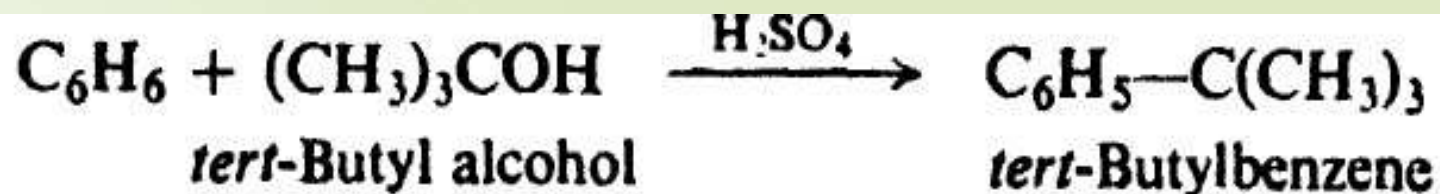
the involvesalkylationFriedel-Craftsformechnism ❖
following steps



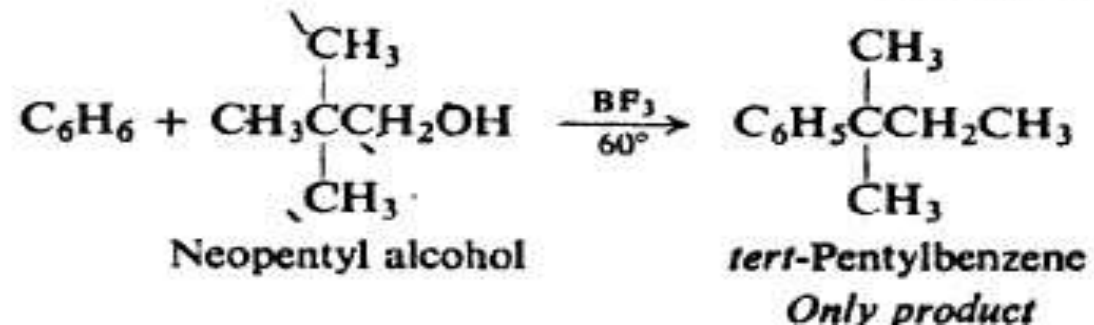
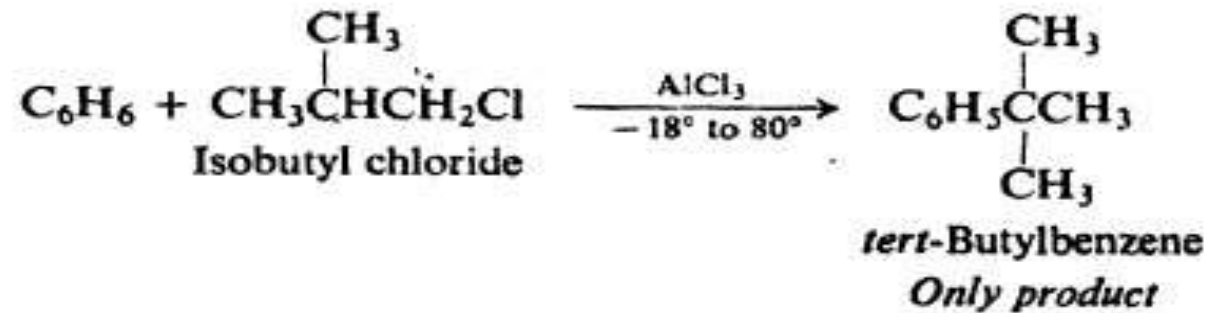
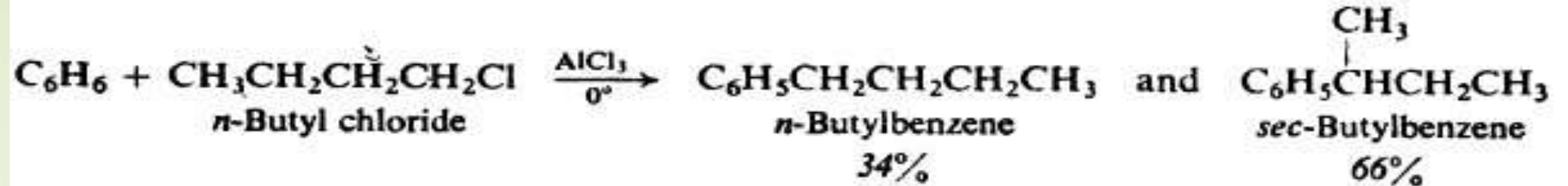
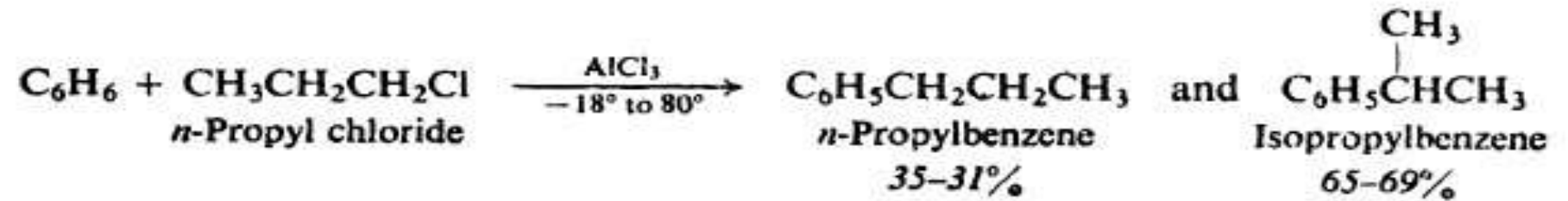
We might expect the benzene ring to be attacked by ❖
carbonium ions generated in other ways: by the action of
acid on alcohols and on alkenes.



*Carbonium ions
from alcohols
and from
alkenes*



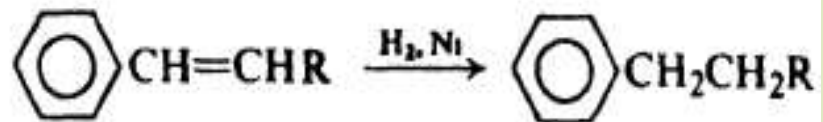
We might expect Friedel-Crafts alkylation \diamond to be accompanied by the kind of rearrangement characteristic of carbonium ion reactions \diamond that



2. Conversion of side chain.

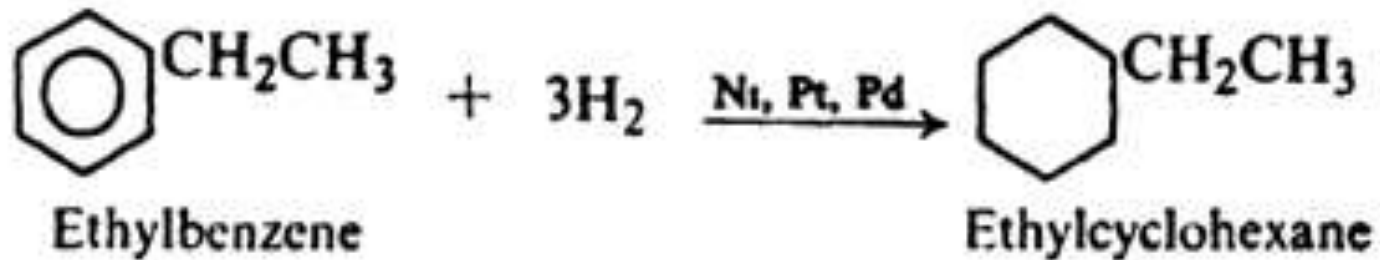


A ketone

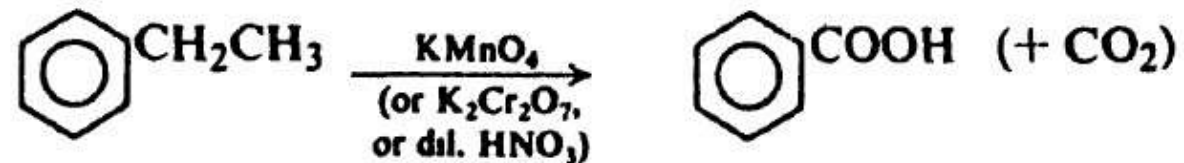


Reactions of alkylbenzenes

Hydrogenation 1.

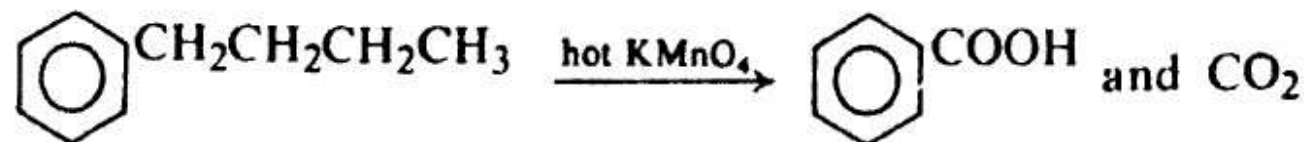


2. Oxidation.



Ethylbenzene

Benzoic acid

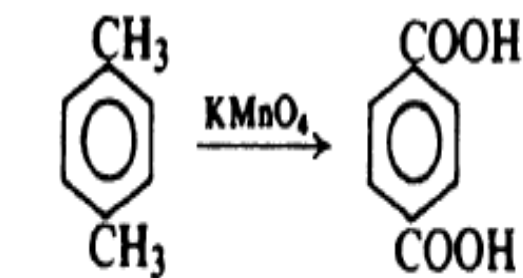


n-Butylbenzene

Benzoic acid

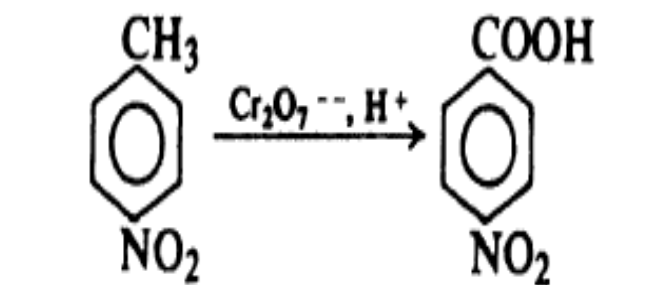
This reaction is used for two purposes: ❖

Synthesis of carboxylic acids



p-Xylene

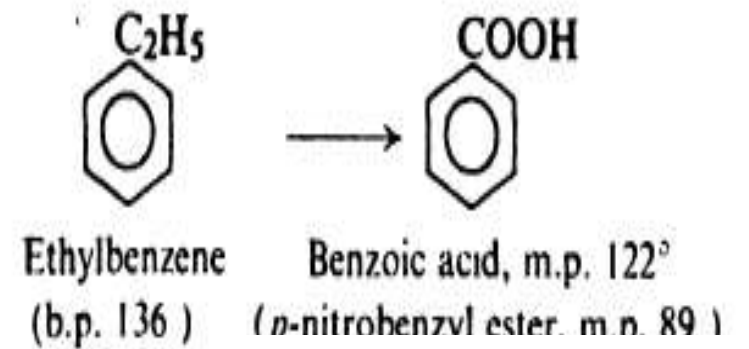
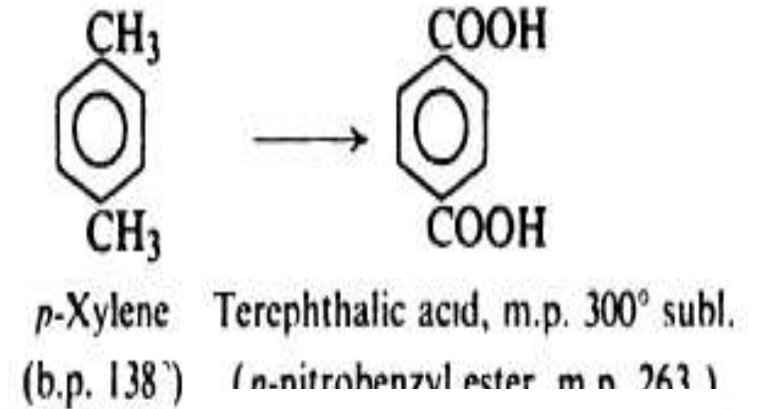
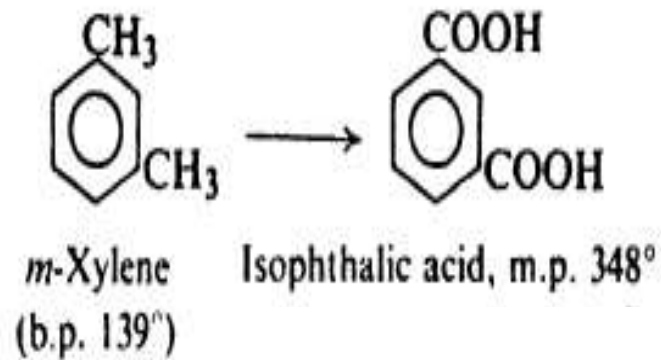
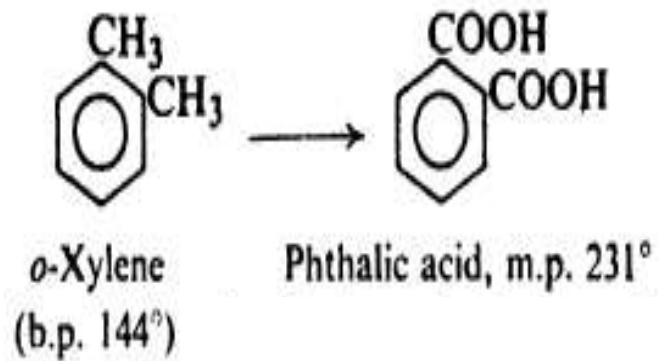
Terephthalic acid
(1,4-Benzenedicarboxylic acid)



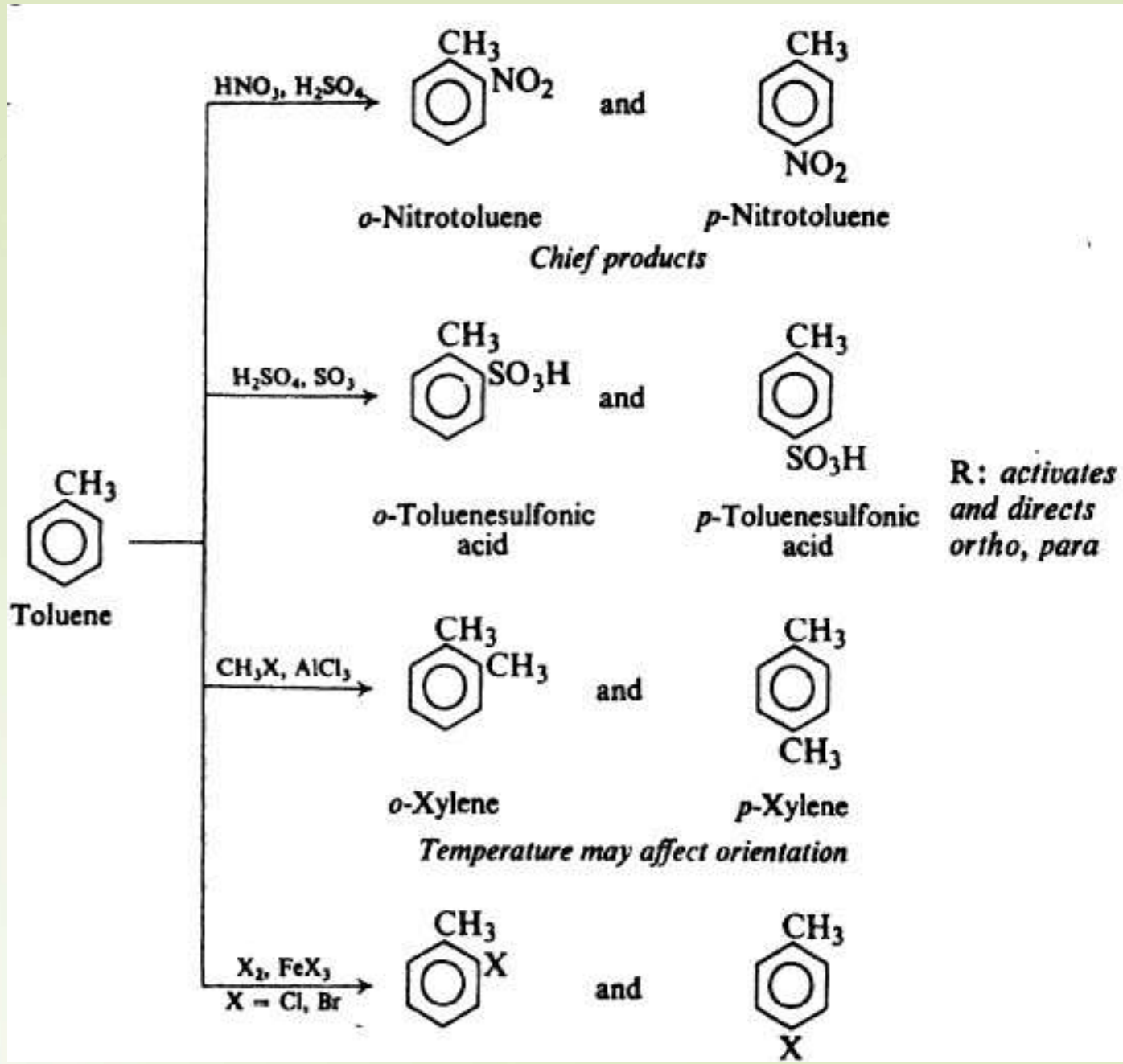
p-Nitrotoluene

p-Nitrobenzoic acid

Identification of alkylbenzenes



3. Substitution in the ring. Electrophilic aromatic substitution.



4. Substitution in the side chain. Free-radical halogenation.

The ring and the side chain. We can control the position of attack \diamond
simply by choosing the proper reaction conditions

