

1.

Topic: Toluene
($C_6H_5CH_3$)

Date: 27-07-20

or

Methyl benzene.

Class: B.Sc. II (Hons.)
Organic Chemistry.

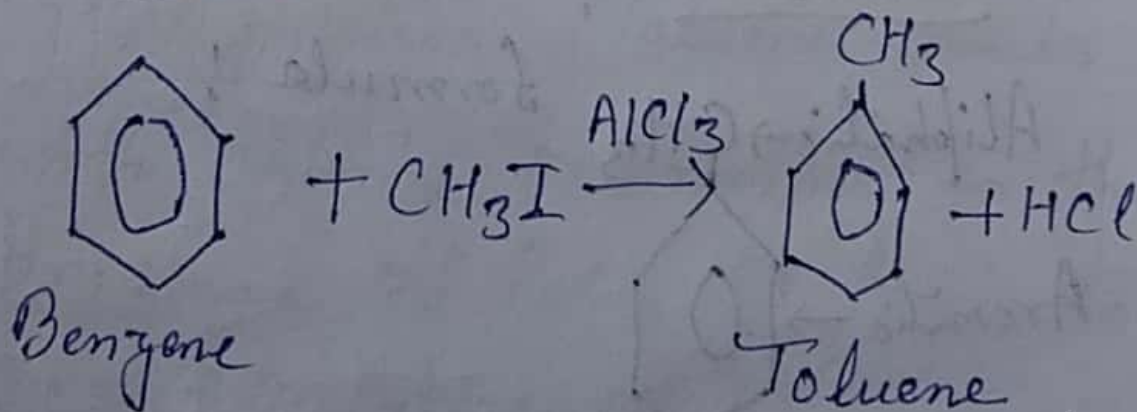
Paper: III C

(By Dr. Manju Kumari)

Toluene is the simplest
arene with a side-chain.

Preparation: Toluene is
obtained:

From Benzene by Friedel-Craft
reaction.



Properties : Physical :

(2)

Toluene is a colourless liquid,
b.p. 110.6°C

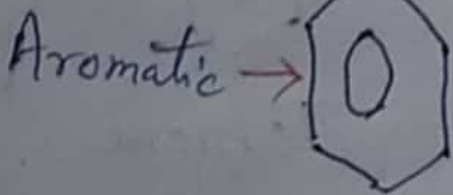
Odour similar to benzene.

Solubility : It is insoluble in water
but highly soluble in
alcohol, ether and benzene.

Toluene it self is a good
solvent for any organic substances.

Chemical : Toluene has the structural

Aliphatic \rightarrow CH_3



formula :



3.

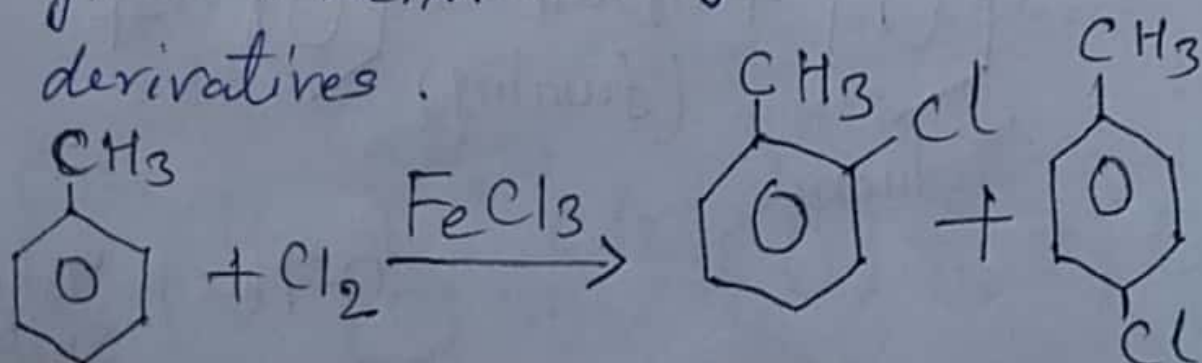
Chemical Properties:

Electrophilic Substitution Reactions:

The methyl group in toluene is electron-releasing. It activates the ring with regard to electrophilic attack at the ortho and para positions.

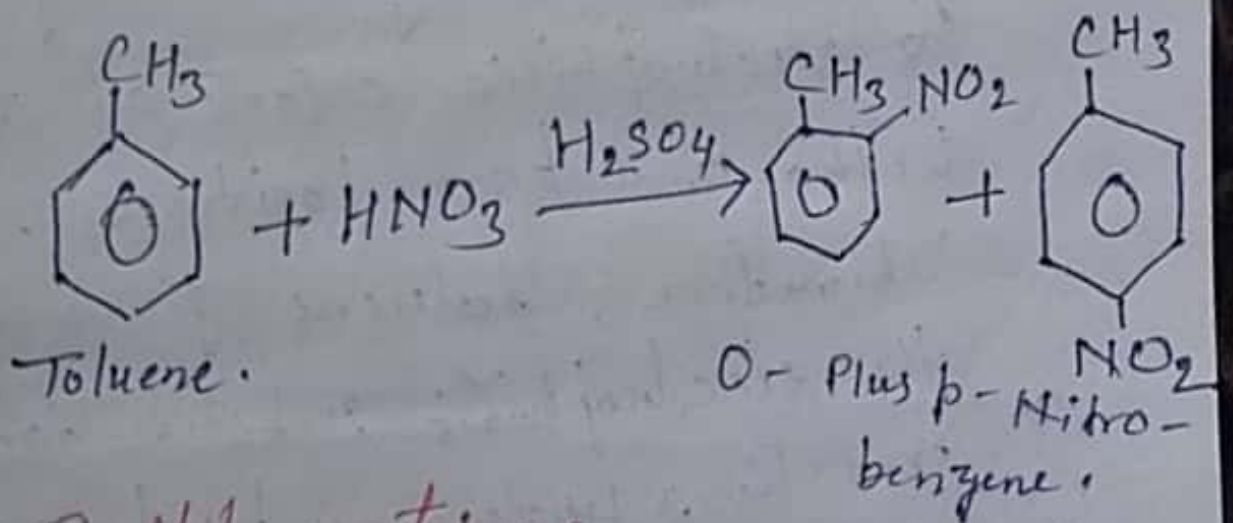
Therefore, toluene gives all the electrophilic substitution reactions undergone by benzene, forming ortho and para derivatives.

(1) Halogenation: Toluene reacts with chlorine or bromine in the presence of $FeCl_3$ or $AlCl_3$ to give a mixture of o- and p-derivatives.



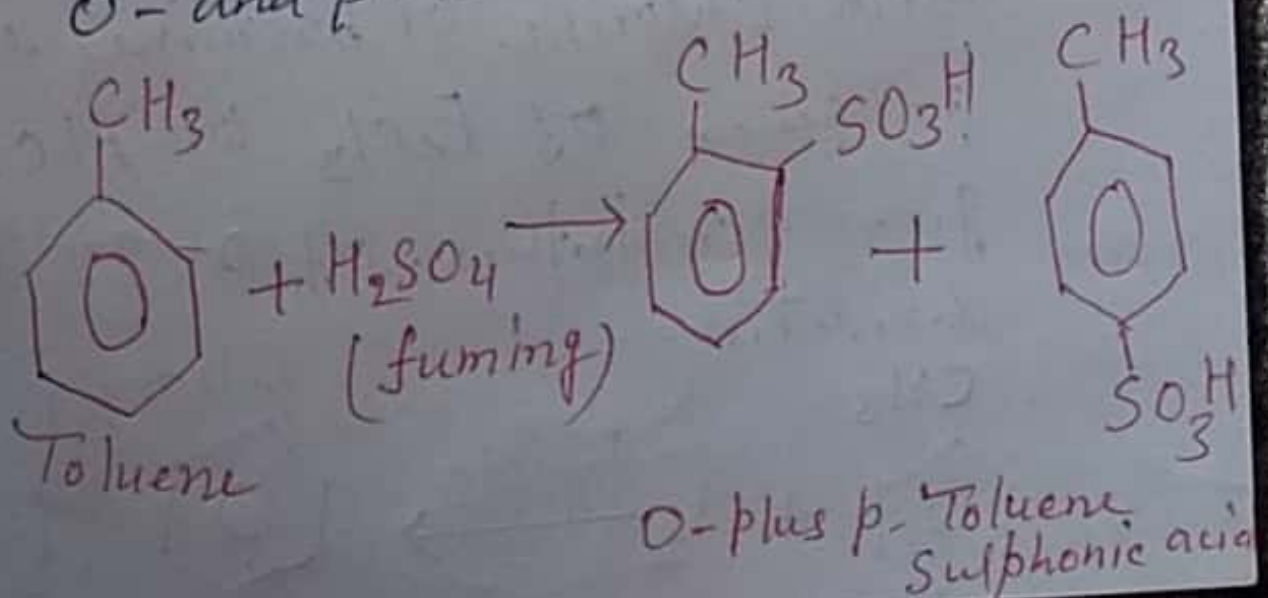
Nitration :

Toluene reacts with a mixture of conc. HNO_3 and H_2SO_4 to give a mixture of ortho and para-nitrotoluene.



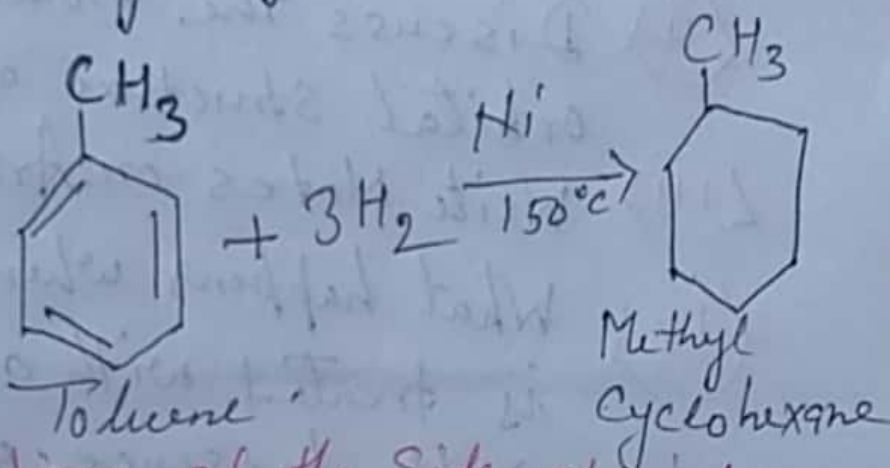
Sulphonation :

Toluene reacts with fuming sulphuric acid (conc. $\text{H}_2\text{SO}_4 + \text{SO}_3$) to form a mixture of o- and p-toluene sulphonic acid.



5.
ADDITION REACTION :
Catalytic Hydrogenation :

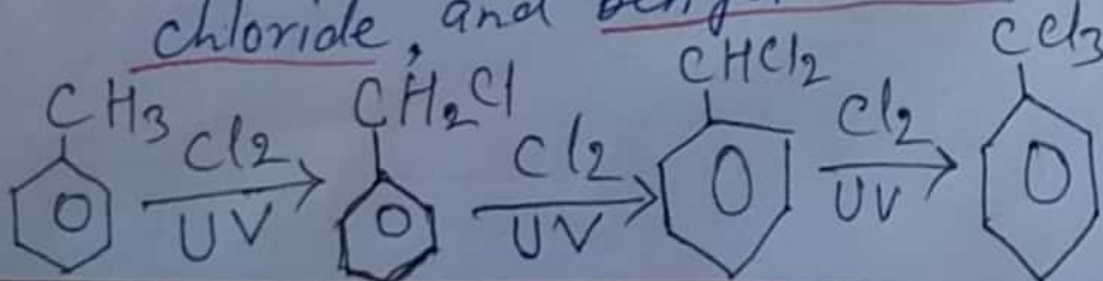
Toluene reacts with hydrogen in the presence of Pt/Ni catalyst at 150°C to yield methyl cyclohexane.



Reactions of the Side-chain :

Side-Chain Halogenations :

When Cl_2 is passed through boiling toluene in the presence of UV (ultra violet light), substitution occurs in the side-chain to give benzyl chloride, benzyl chloride, and benzotrichloride.



Some important questions :-

(i) What is Huckel rule?

(ii) Discuss the molecular orbital structure of Benzene.

(iii) Write Notes on: Aromaticity

(iv) What happens when benzene is treated with acetyl chloride in the presence of $AlCl_3$?

(v) How is Toluene prepared? Describe its important reactions.

—X—