

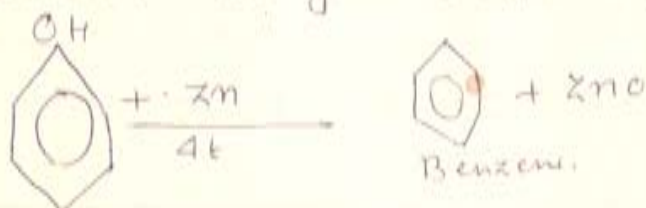


BENZENE ✓

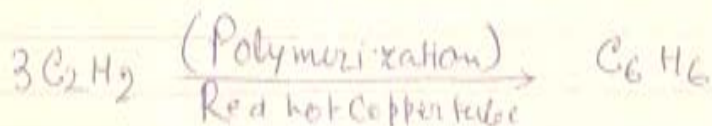
N.H

Preparation :-

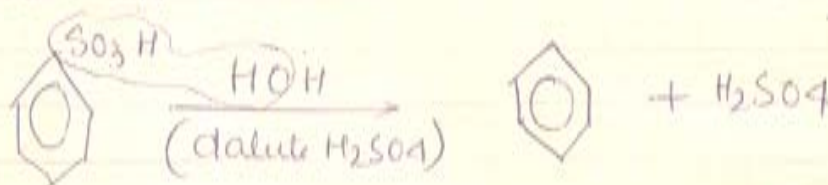
1. When Phenol is heated with Zinc dust due to reduction we get Benzene. ($Zn + ZnO$)



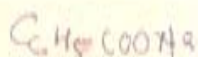
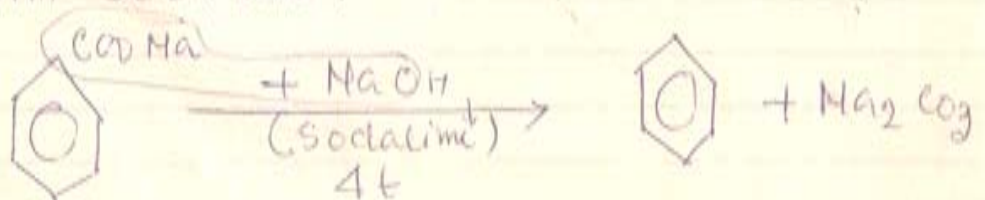
2. When Acetylene gas is passed through red hot Copper tube due to polymerization we get Benzene



- (3) When Benzen Sulphonic acid is hydrolyzed with a little dilute H_2SO_4 Benzene is resulted.



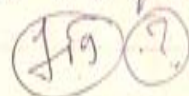
4. Although it is costly, It may be prepared in the lab. by heating ~~any~~ Sodium Benzoid with Soda lime.



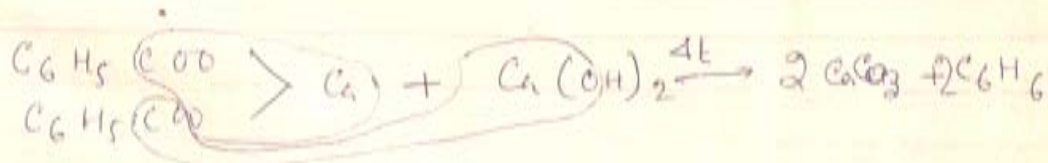


Procedure → In a hard glass test tube about 30gms of sodium benzoate is mixed with about 20gms of Soda lime. It is fitted with a delivery tube, connected to a water Condenser which is connected to a receiver as shown in the Diagram.

On heating the mixture directly we get vapour of C_6H_6 which being cooled is condensed to a liquid and is collected in the receiver.



(5) When Calcium Benzoate is heated with Soda lime Benzene is formed.



Industrial Preparation

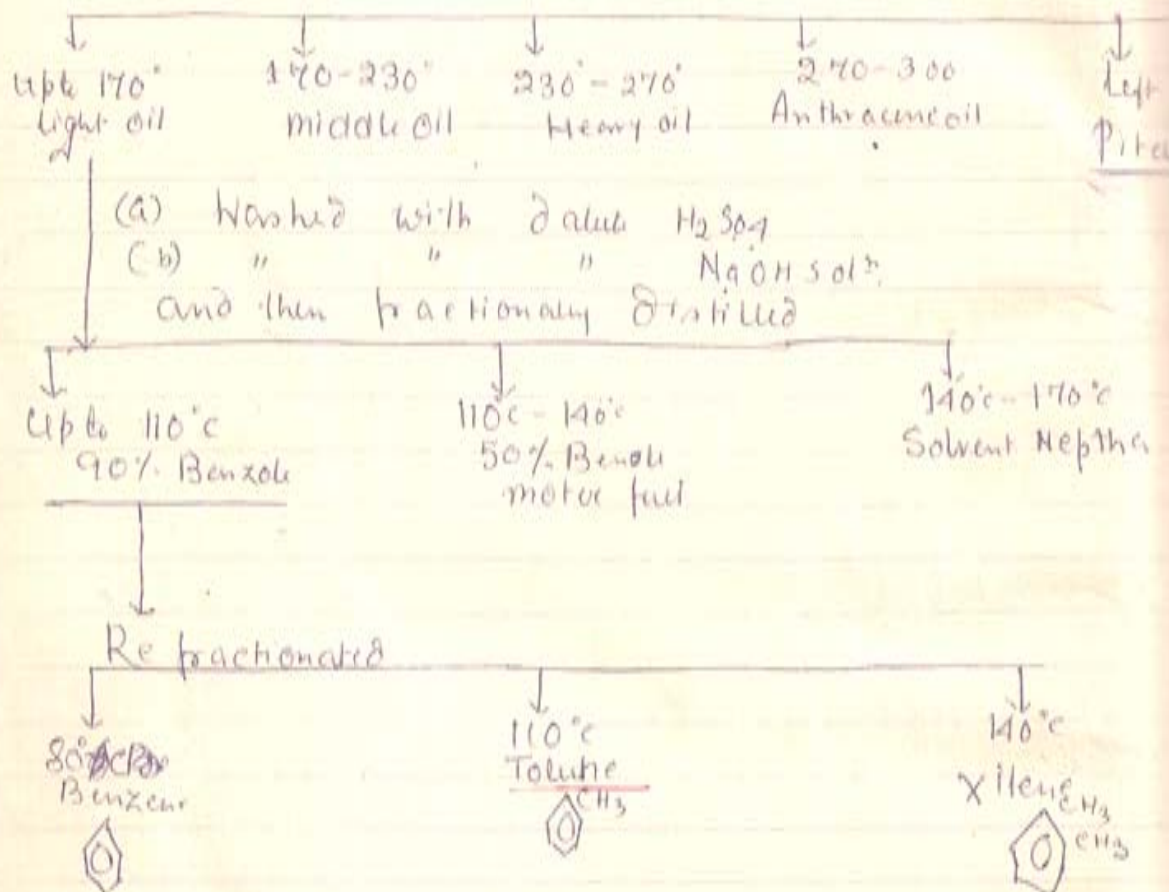
Coal tar is the main source for the industrial preparation of Benzene. When Coal tar is distilled fractionally we get the first fraction in between room temp^o and 140^oC we call it "light oil". This is the source of Benzene the other fraction middle oil, heavy oil, anthracene oil, are the products at higher temp^o respectively.

The light oil is washed with (a) dilute H_2SO_4 to remove the basic impurities and then (b) washed with dilute NaOH solⁿ to remove the acidic impurities. This is then distilled.



fractionally. The distillate upto 110° is known as 90% Benzole. This Benzole is again fractionated and product at 80°C is collected. This is Commercial Benzene.

COAL TAR DISTILLATION



Physical Properties

It is a colourless, highly refractive mobile liquid
 B.P. 80.4°C . Sp gravity 0.8799 so it floats over water. It has a burning test and has a piquant smell which is not ~~sharp~~

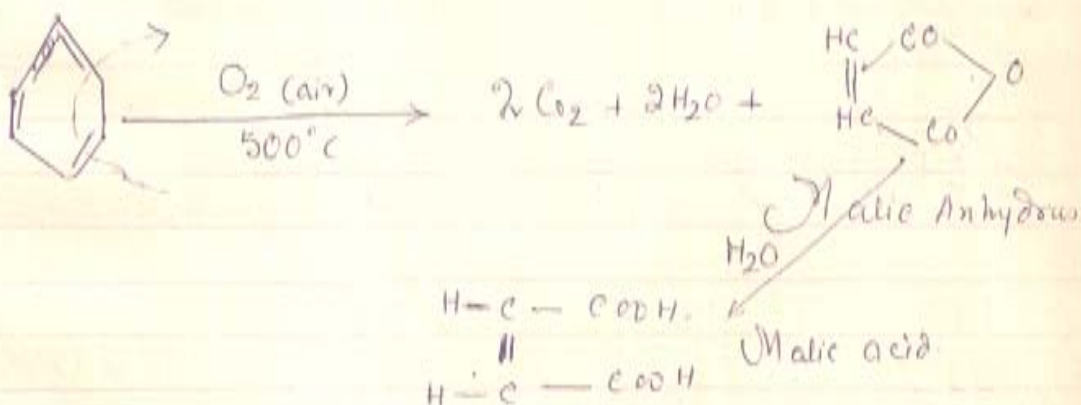


impermanent, It is insoluble in water but soluble in ether, alcohol and petrol in all proportions.

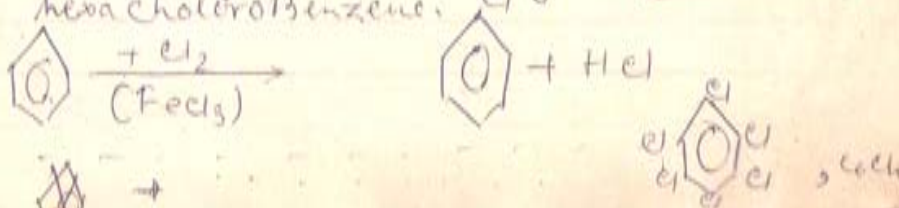
It can dissolve readily fat, sulphur, iodine and resins. It is highly inflammable and it burns with a smoky flame which indicates high percentage of carbon. Benzene contains 6π and 6σ bonds. 12 σ bonds.

CHEM PROP

(i) Benzene is not affected by KMnO_4 , $\text{K}_2\text{Cr}_2\text{O}_7$ although it has alternate double bond but the alternate double bonds do resonating structures but if Benzene is heated at 500°C with air in the presence of V_2O_5 it is oxidised to form (Maleic) anhydride.

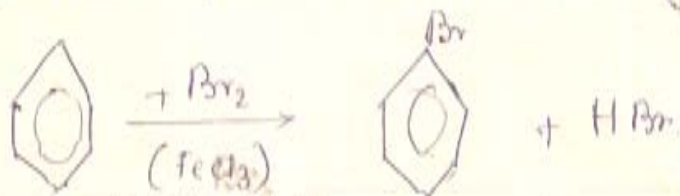


(2) Chlorination \rightarrow When Benzene is heated with chlorine in the presence of FeCl_3 (catalyst) due to chlorination we get Chlorobenzene. If it is continued for a longer period, one by one all the hydrogen atoms may be substituted giving hexachlorobenzene.



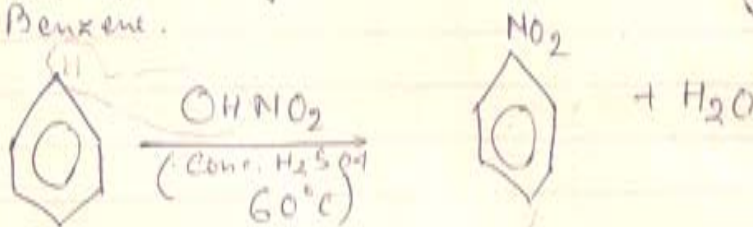


③ Bromination \rightarrow When Benzene is heated with Br_2 in the presence of FeBr_3 due to Bromination we get Bromo Benzene. If it is continued further as above we get C_6Br_6

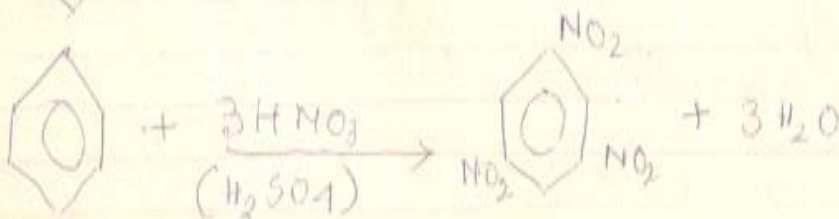
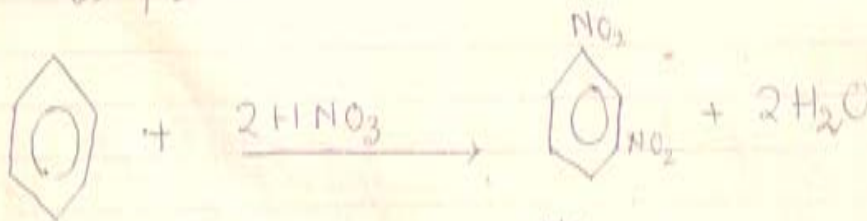


N.B. - ~~No~~ Iodination is not possible because among the members of halogen family, I_2 is the least reactive / lazy element.

Pass (4) \rightarrow Nitration \rightarrow When Benzene is treated with Conc. HNO_3 in the presence of Conc. H_2SO_4 (catalyst) at 60°C we get Nitro Benzene.

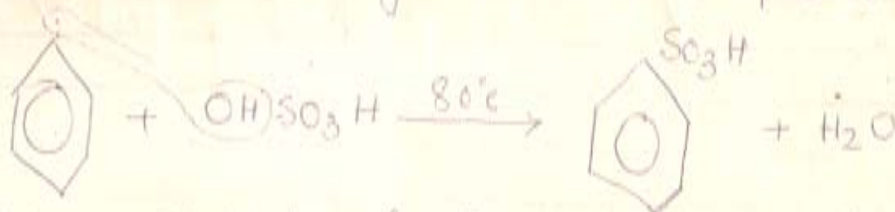


However at higher temp^r we get Meta dinitro Benzene and with fuming nitric acid we get bi nitro Benzene (T.N.B) explosive.



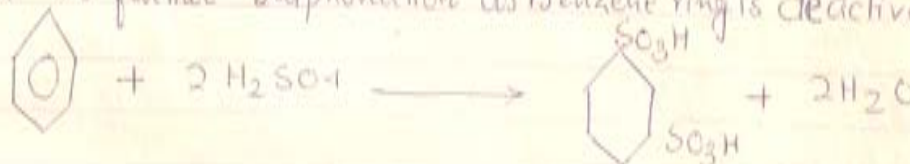


(5) Sulphonation → When Benzene is heated with conc H_2SO_4 at 80°C we get Benzene Sulphonic acid



However at higher temp^s with fuming H_2SO_4 we get Meta Benzene di Sulphonic acid.

But no further Sulphonation as Benzene ring is deactivated.

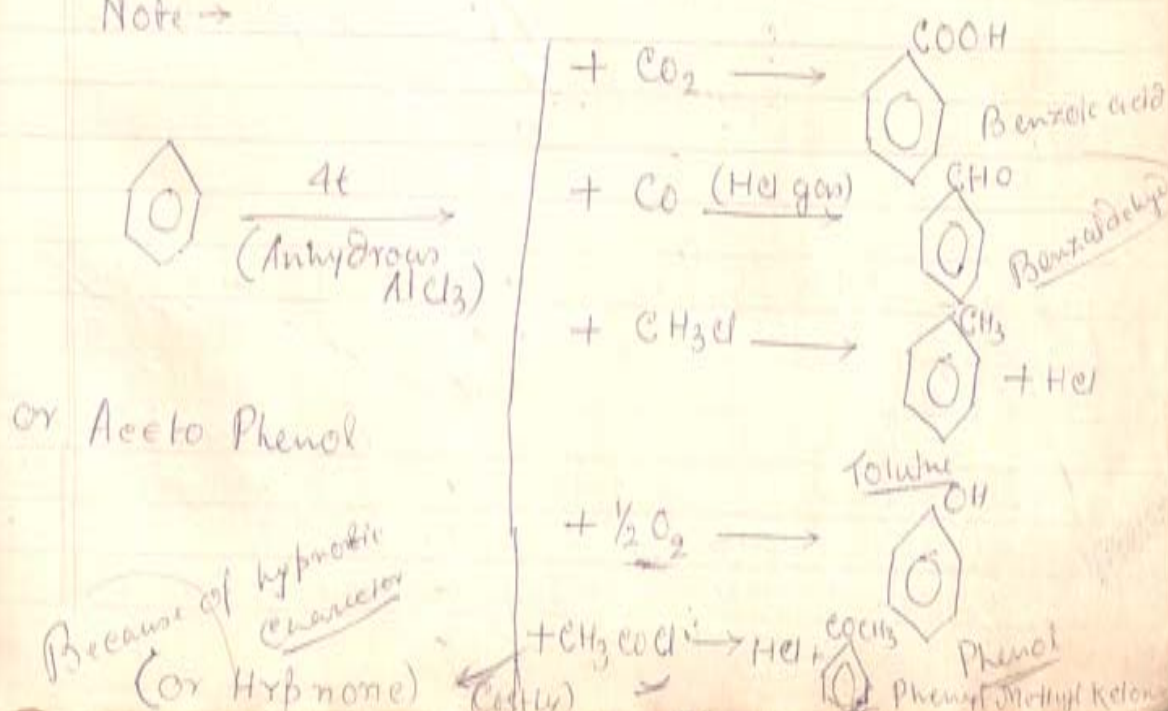


Con (6)

FRIEDEL - CRAFT Reaction

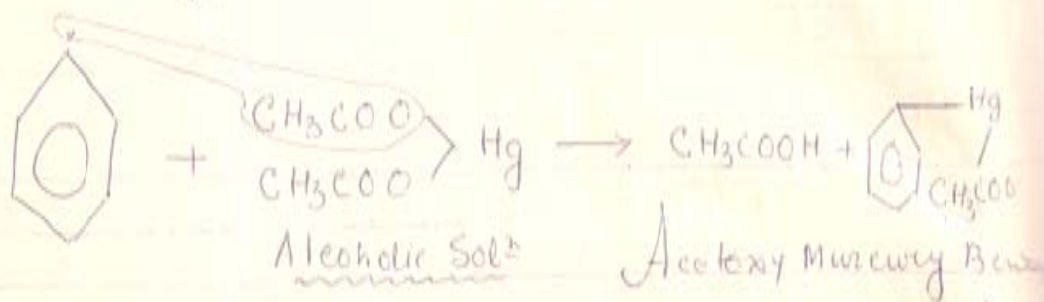
Benzene reacts with ordinary reagent like CO_2 , CO etc. in the presence of anhydrous AlCl_3 as a catalyst we get very important derivatives of Benzene. This reaction is so called, after the name of the scientists.

Note →



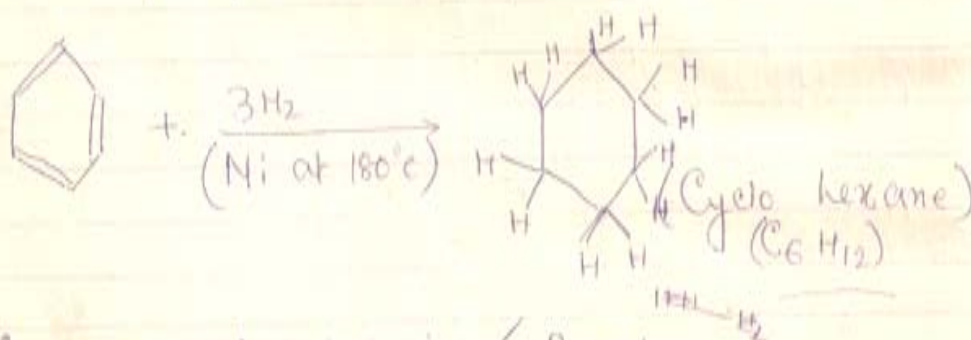


- (7) Mercuration → Benzene is readily (mercuroated) by heating with mercuric acetate, in alcoholic solⁿ to form Phenyl Mercuric acetate / Acetoxy - mercuric Benzene.



Addition Reaction

- (8) With Hydrogen — In the presence of Nickel as a catalyst at 180°C, Benzene reacts with hydrogen to form Cyclohexane (C₆H₁₂)

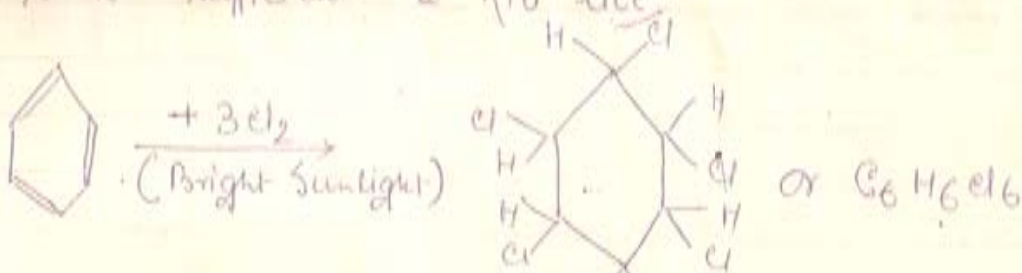


9. Addition of Chlorine / Bromine

In bright sunlight and in the absence of catalyst Benzene reacts with Chlorine / Bromine to form C₆H₆Cl₆ / C₆H₆Br₆ respectively. The former one is used as a powerful insecticide (To kill insect) and is sold in the market by the name Lammexane or 666. It is a white powder insoluble in water.

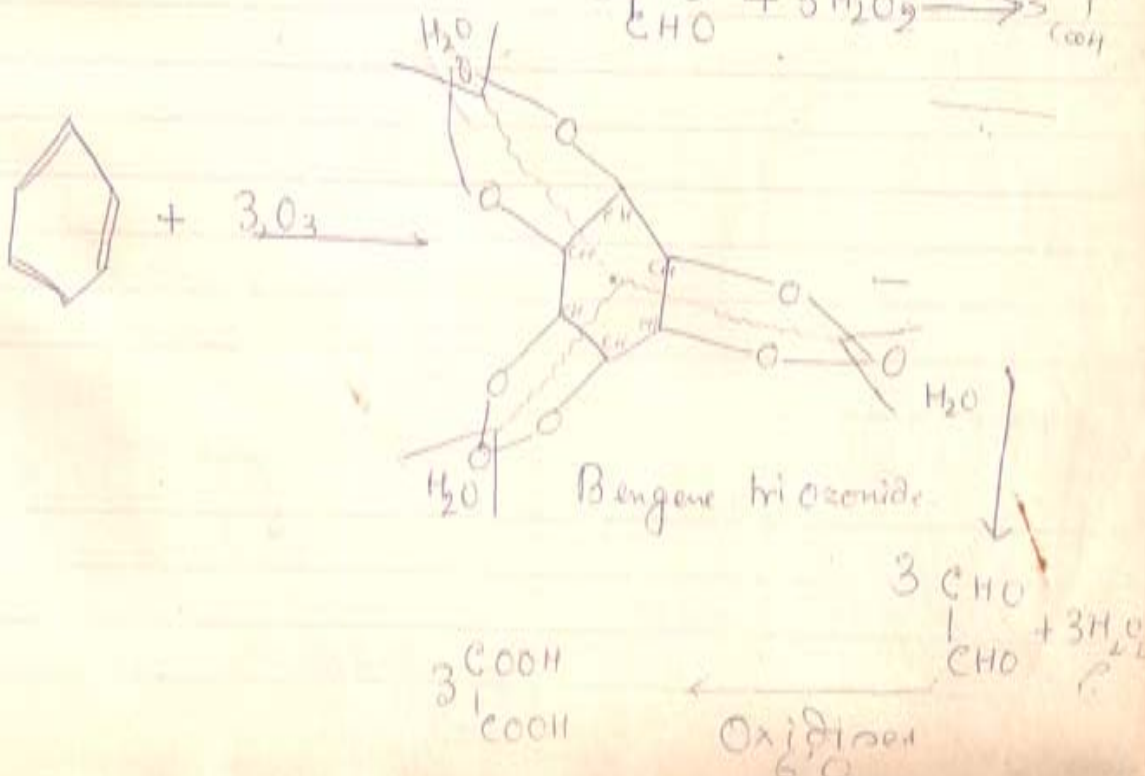
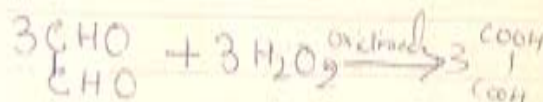
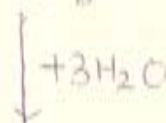
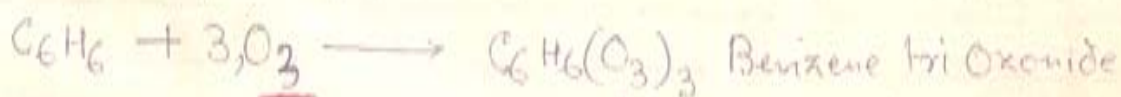


but soluble in alcohol. The alcoholic solⁿ nearly 0.5% is sufficient - to kill lice



Similarly we get $\text{C}_6\text{H}_6\text{Br}_6$ (Benzene hexabromide)
 Benzene hexachloride

Ozonolysis \rightarrow Benzene reacts with Ozone to form Benzene tri Oxonide which with a little water gives glyoxal and H_2O_2





• Uses of Benzene

- (1) Good solvent for organic compound like fat, oil etc.
- (2) For dry cleaning of woollen clothes.
- (3) Mixture of Petrol Benzene and alcohol is used as a liquid fuel for Airship.
- (4) As a parent compound for dyes, (colour) medicine, explosive, plastic and perfumes

How can you (a) introduce and (b) Remove (delete) the following groups in Benzene ring or nucleus.

- (1) — OH
- (2) — SO₃H
- (3) — Cl
- (4) — COOH //