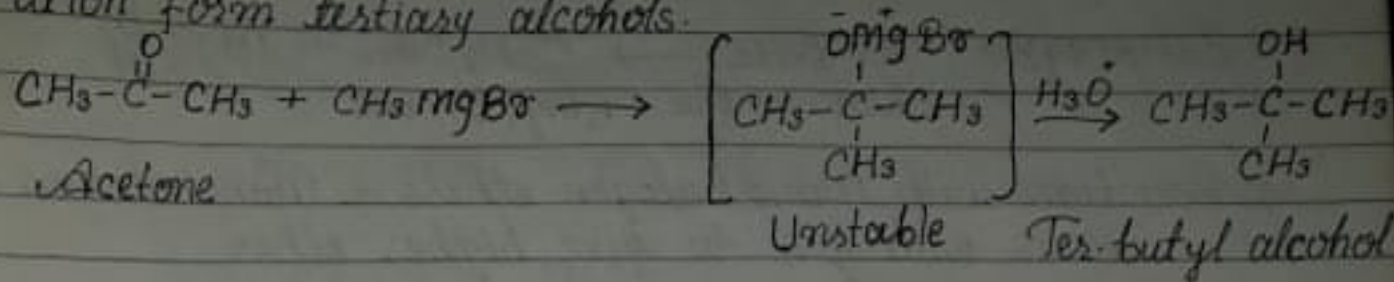
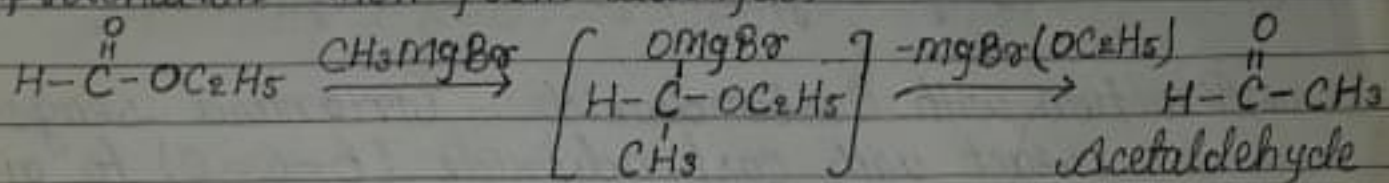


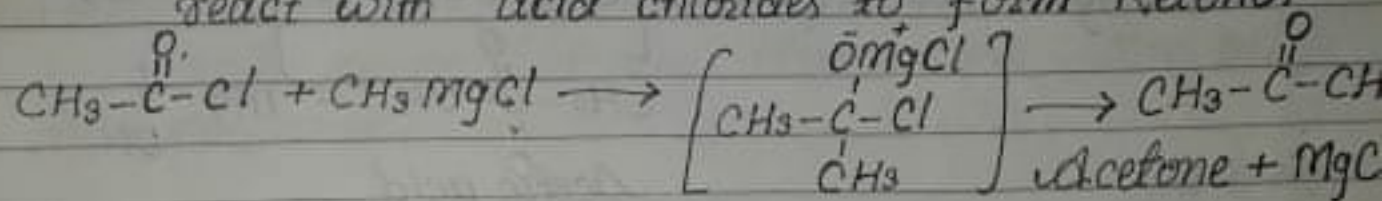
(9) Reaction with Ketones - Grignard reagents react with ketones to give addition product which on protonation form tertiary alcohols.



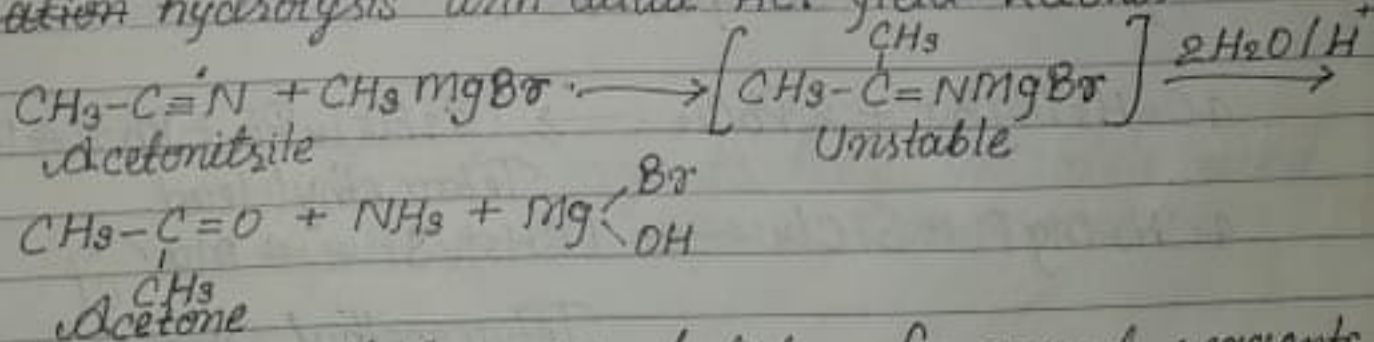
(10) Reaction with Esters :- Grignard reagents react with ethyl formate to give addition product which on protonation then form aldehydes.



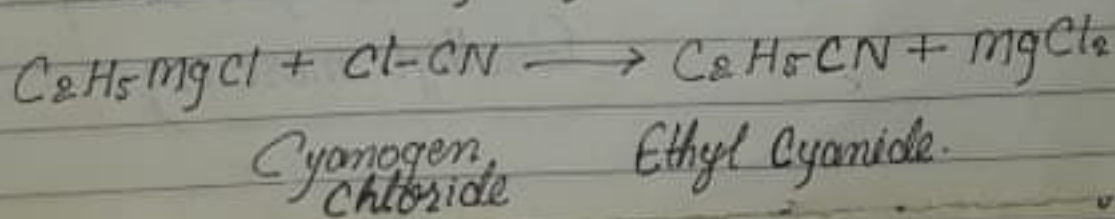
(11) Reaction with Acid chloride :- Grignard reagents react with acid chlorides to form ketones.



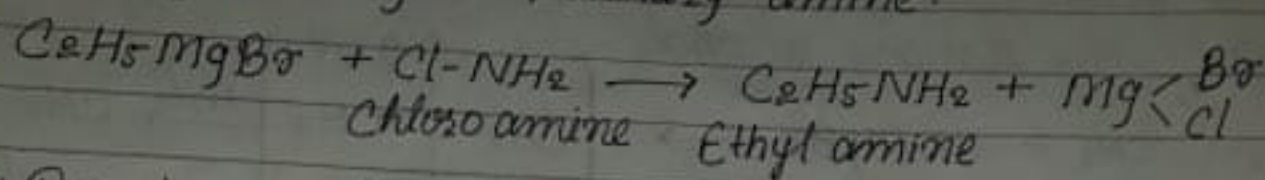
(12) Reaction with Cyanide :- Grignard reagents react with cyanides to give addition product which on protonation hydrolysis with dilute HCl yield ketones.



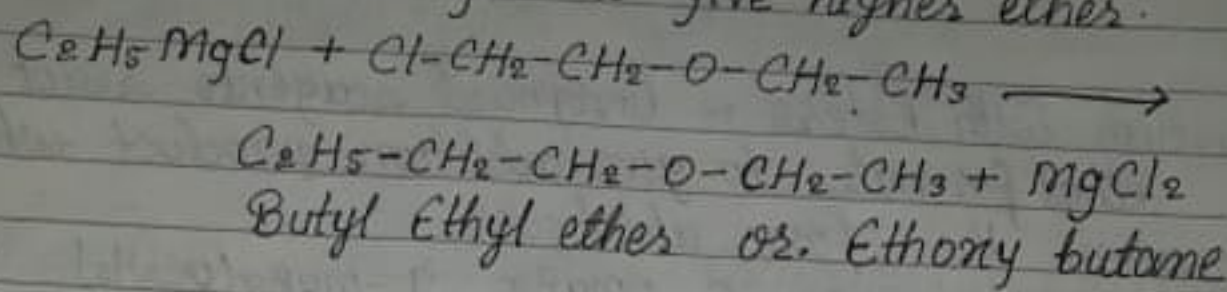
(13) Reaction with Cyanogen halide :- Grignard reagents react with cyanogen chloride to give alkyl cyanide.



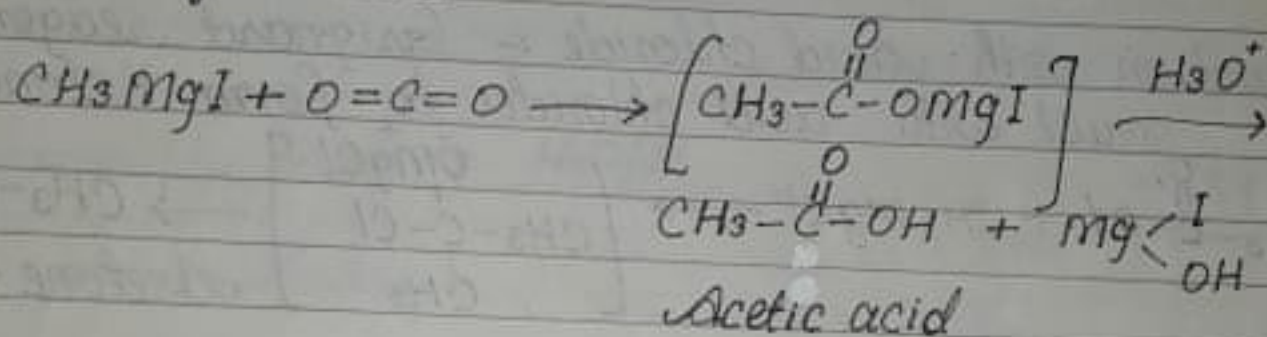
14. Reaction with Chloroamine :- Chloro amine reacts with g.r. to give Primary amine.



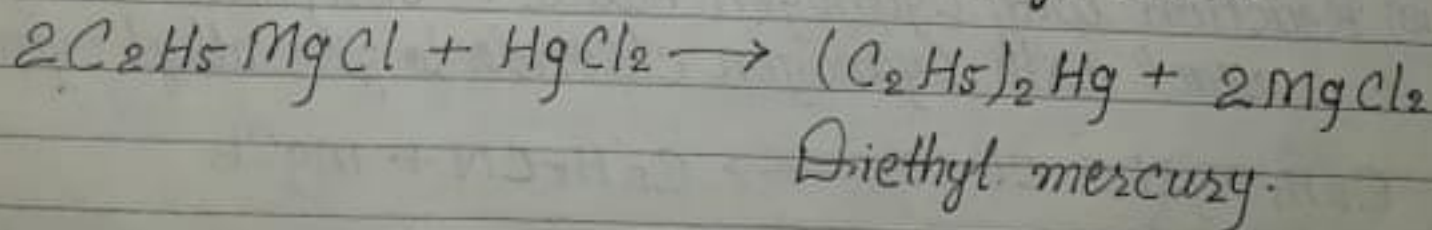
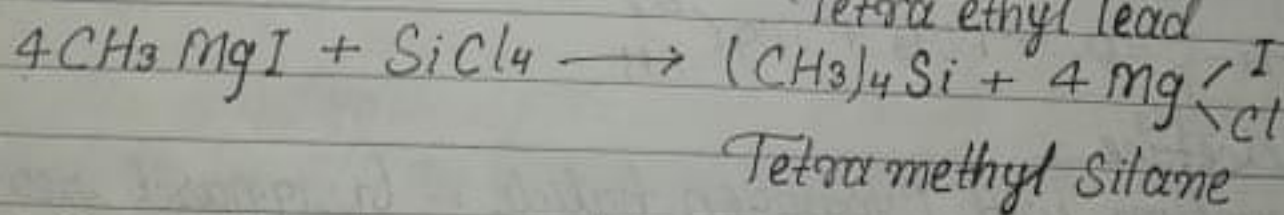
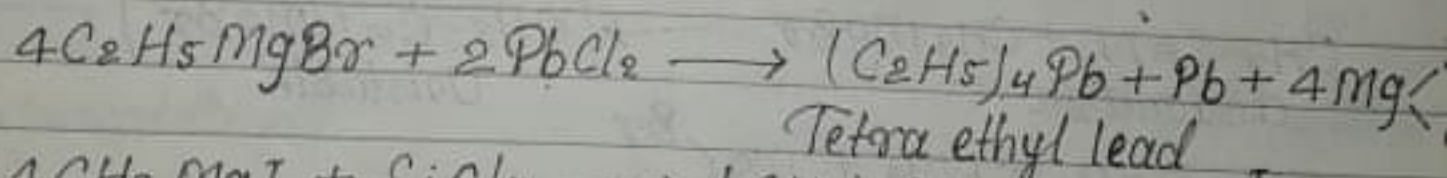
15) Reaction with Monohalogen ethers :- Monohalogen ether reacts with g.r. to give higher ether.



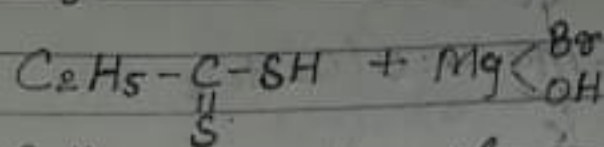
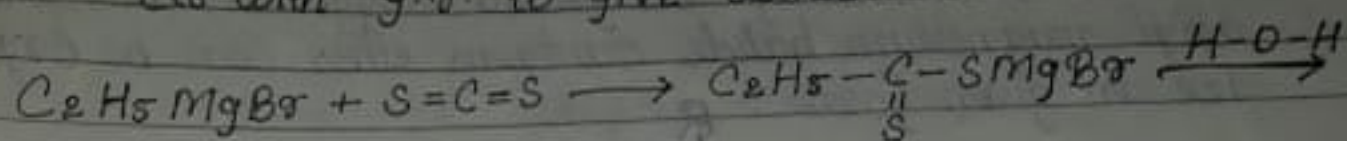
16) Reaction with Carbon dioxide :- Grignard reagent reacts with carbon dioxide ($\text{O}=\text{C}=\text{O}$) to give addition products which on protonation yield carboxylic acids.



17) Reaction with Inorganic halides :- Grignard reagent reacts with inorganic halides to form other organometallic compounds.

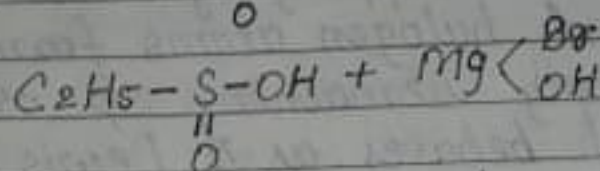
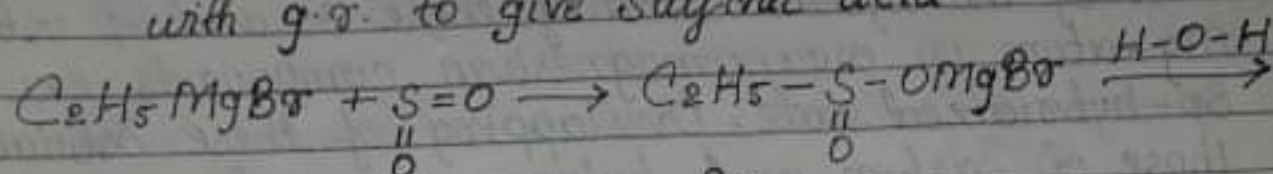


(18) Reaction with Carbonyl sulfide :- Carbonyl sulfide reacts with g.r. to give dithiocarbamic acid.



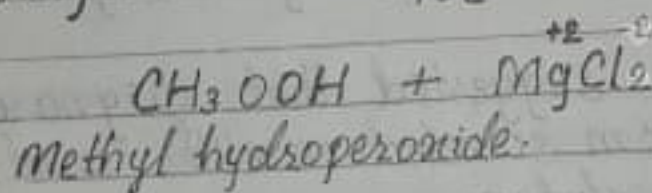
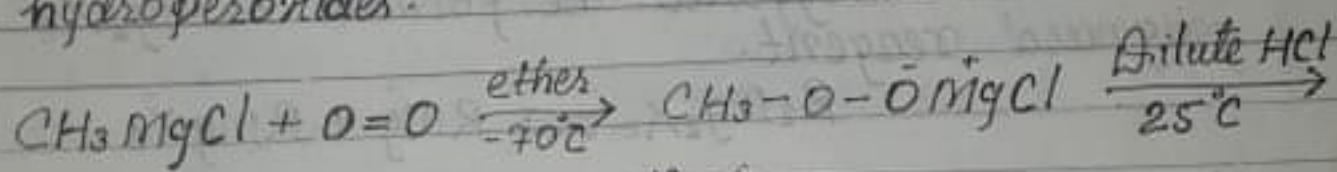
Dithiopropanoic acid

(19) Reaction with Sulfoxide :- Sulfoxide reacts with g.r. to give sulfonic acid.



Ethane sulfonic acid

(20) Reaction with Oxygen :- Grignard reagent reacts with oxygen at low temperature form alkyl hydroperoxides.

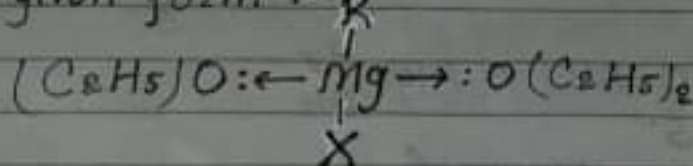


Uses:-

Grignard reagents have versatile used for the synthesis of organic compounds.

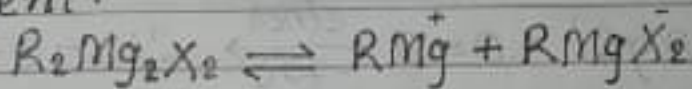
Structure of Grignard reagent:

The structure of grignard reagent is not understood certainly. Grignard suggested that the alkyl magnesium halide contains ether can be crystallize in given form :-

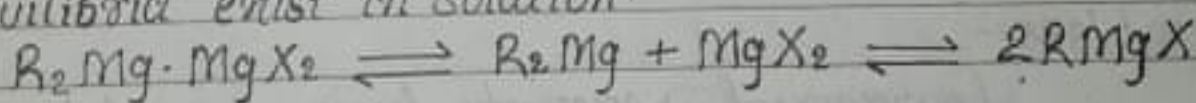


The electronic configuration of Mg is $1s^2 2s^2 2p^6 3s^2$. By promoting ^{one} of the 3s electron to 3p orbitals and then by the hybridization of these 3s and 3p orbitals. Mg-atom in organomagnesium compounds exist in sp-hybridized state. Overlapping of these orbitals with those of carbon and halogen atoms form σ -bond. There are two empty remaining sp orbitals on Mg due to which behaves as a Lewis acid and co-ordinates with two ether molecules.

Jolibois in 1912 observe that Mg is present both in the form of anions and cations and suggested the formula $R_2Mg_2X_2$ for grignard reagent.



In 1955 Ubbelohde suggested that grignard reagent exist in dimeric form solvated in ether and following equilibria exist in solution.



NMR suggested the formula of Ubbelohde. So, finally structure of grignard reagent is $RMgX$.

NMR means Nuclear Magnetic Resonance.