NAST Secondary School

ORGANIC CHEMISTRY

Grade-XII

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Lecturer Of Chemistry

Chapter-17 Organometallic Compound

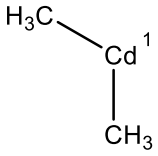
Organometallic compounds are those compounds in which carbo is bonded with metal. Such as Cu, Li, Cd, Mg, Al, K, Ca, Pb, Au, Co, Ni, Fe, etc.

I organometallic compounds carbon is bonded with positively charged atom (metal) & bears with partial positive charged in metal & partial negative charged in carbon atom. Hence, organometallic compounds are polar in nature. e.g.

R-Li →alkyllithium,

R_2 -Cd →Dialkyl Candium

e.g.



dimethylcadmium

methyllithium

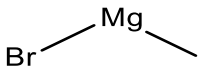
Grignard Reagent

[Francois Augustte Victor Grignard]

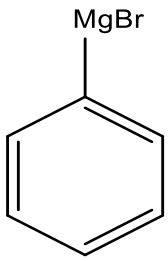
R-MgX / Ar-MgX

Alkyl magnesium halide or Aryl Magnesium halide is commonly known as Grignard reagent. It is replaced by

e.g. CH_3MgBr



Methyl magnesium bromide

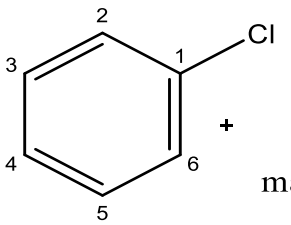


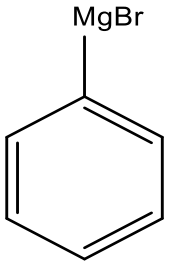
phenylmagnesium bromide

Preparation Of Grignard Reaction

1) From haloalkane

$$R\text{-}X + Mg \xrightarrow{\text{Dry ether}} RMgX$$



chlorobenzene + Mg (magnesium) $\xrightarrow{\text{Dry ether}}$ 

phenylmagnesium bromide

2) Action with H_2O

$$R\text{-}MgX + H_2O \longrightarrow R\text{-}H + Mg(OH)X$$

e.g.

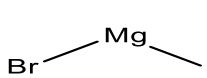
$$CH_3\text{-}MgCl + H_2O \longrightarrow CH_3\text{-}H + Mg(OH)Cl$$

methylmagnesium chloride + water → methane + magnesium chloride hydroxide

3) Action with CO_2

$$R\text{-}MgX + CO_2 \xrightarrow{\text{dry ether}} R\text{-}COOMgX \xrightarrow{H_2O/H^+} R\text{-}COOH + Mg(OH)X$$

e.g.



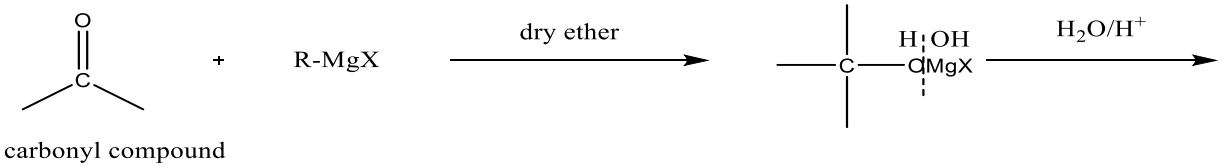
Methyl magnesium bromide + CO_2 (carbon dioxide) $\xrightarrow{\text{dry ether}}$ $CH_3\text{-}COOMgBr$

$\xrightarrow{H_2O/H^+}$ $CH_3\text{-}COOH$ + $Mg(OH)Br$

magnesium bromide hydroxide

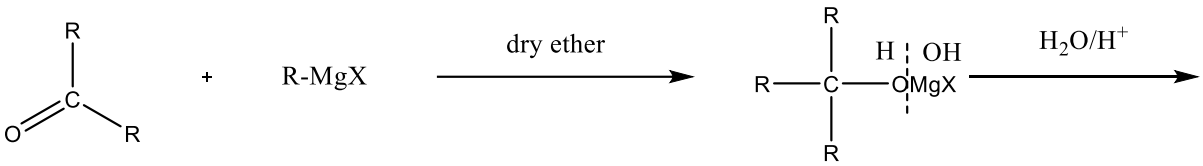
4) Action with carbonyl compound

When carbonyl compounds are reacted with Grignard reagent in presence of dry ether first it gives additional product which on hydrolysis gives alcohol. Formaldehyde gives 1^o alcohol, all the rest of aldehyde gives 2^o alcohol and ketone gives 3^o alcohol.

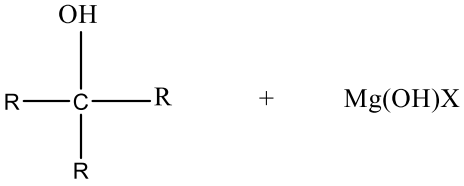


carbonyl compound

a) Action with ketone

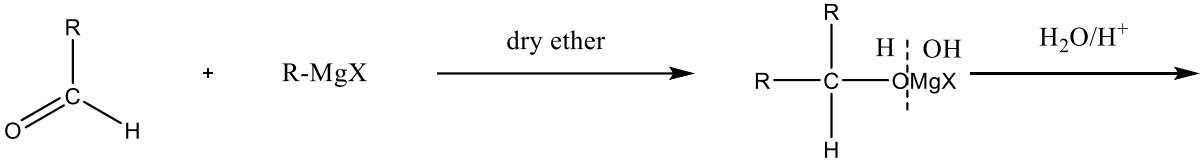


Ketone

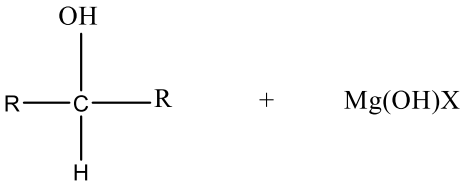


3^o alcohol

b) Action with aldehyde

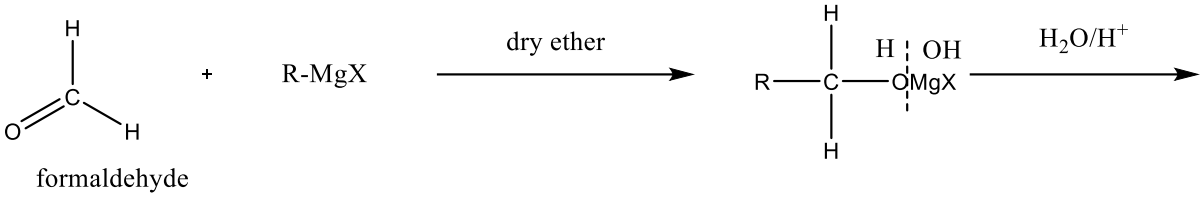


aldehyde

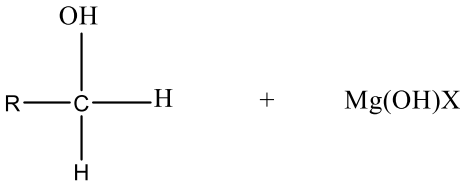


2^o alcohol

c) Action with formaldehyde

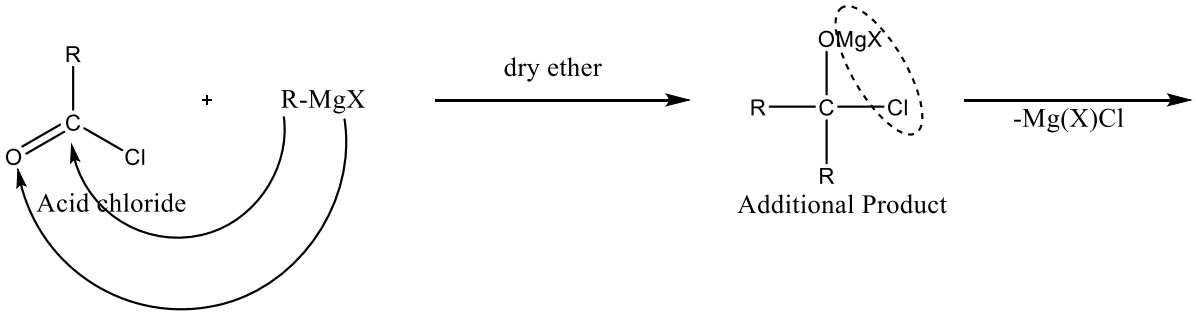


formaldehyde



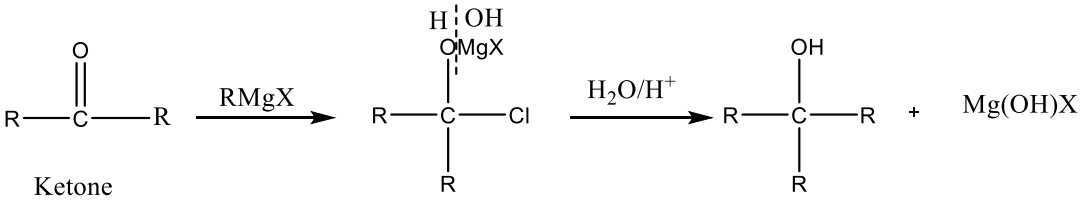
1^o alcohol

5) Reaction with acid chloride



Acid chloride

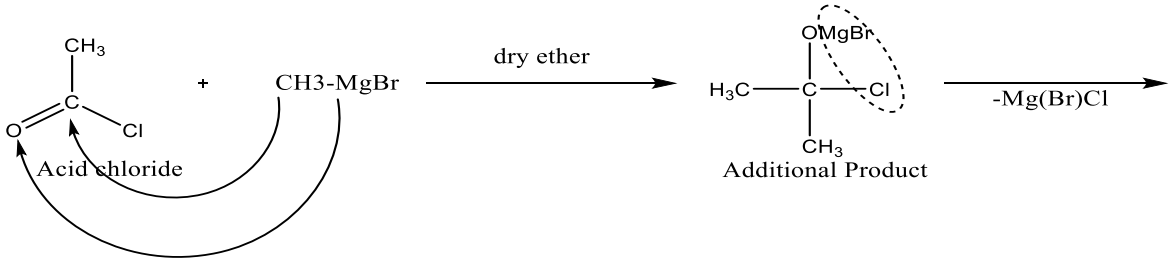
Additional Product



Ketone

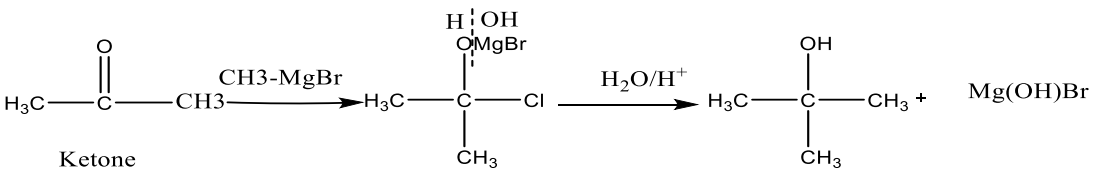
3^o alcohol

e.g.



Acid chloride

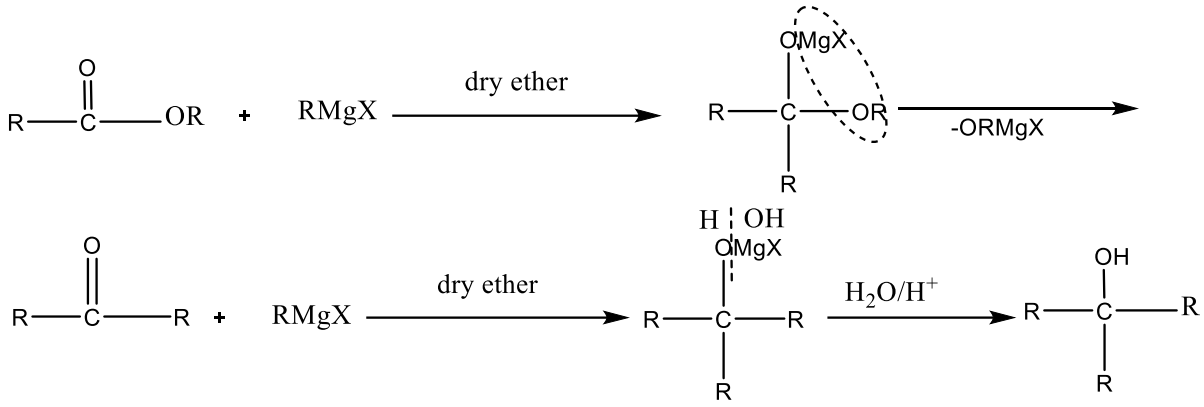
Additional Product



Ketone

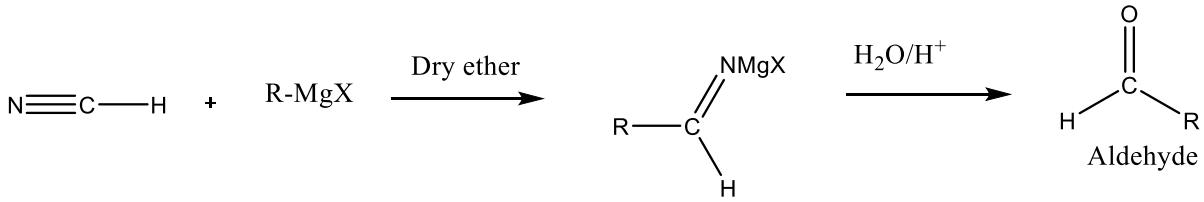
3^o alcohol

6) Reaction with ester



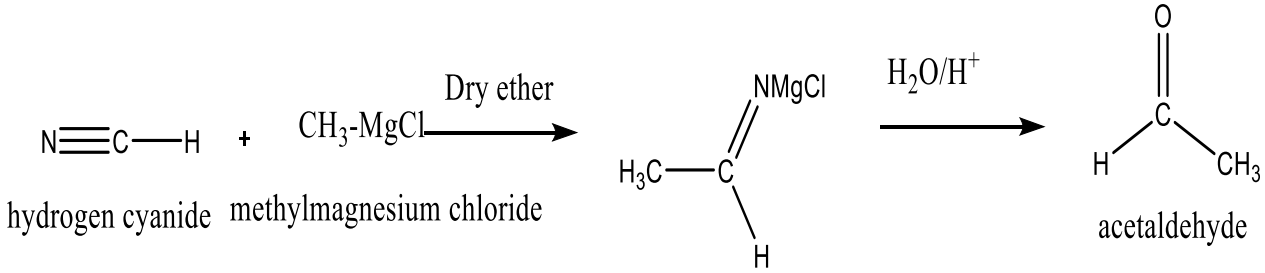
+ Mg(OH)X

7) Reaction With HCN



NH_3 + Mg(OH)X

e.g.



hydrogen cyanide methylmagnesium chloride

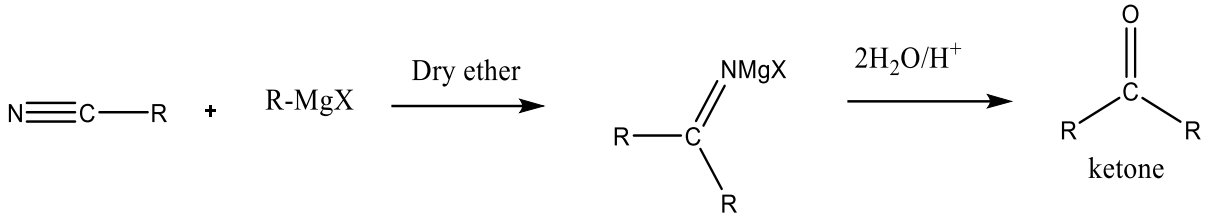
magnesium chloride ethylideneamide

acetaldehyde

NH_3 + Mg(OH)Cl

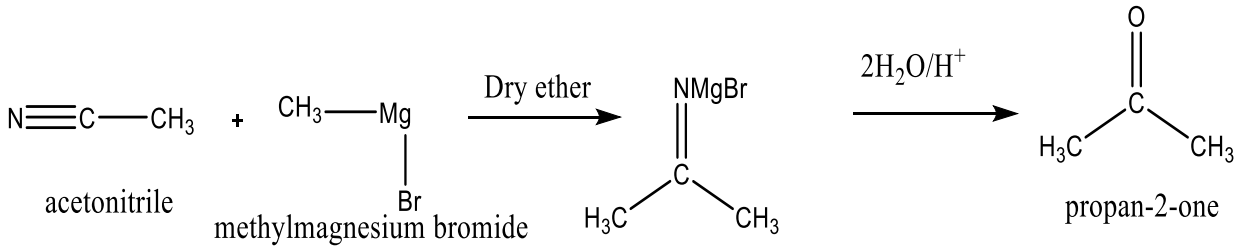
ammonia magnesium chloride hydroxide

8) Reaction with RCN



NH_3 + Mg(OH)X

e.g.



acetonitrile

methylmagnesium bromide

magnesium bromide propan-2-ylideneamide

propan-2-one

NH_3 + Mg(OH)Br

ammonia magnesium bromide hydroxide

! THE END !