

Grignard Reagent Chemistry Questions with Solutions

Q1. Alkyl halides can be converted into Grignard reagents by ____.

- a.) Boiling them with Mg ribbon in alcoholic solution
- b.) Warming them with magnesium powder in dry ether
- c.) Refluxing them with $MgCl_2$ solution
- d.) Warming them with $MgCl_2$

Correct Answer– (b.) Warming them with magnesium powder in dry ether.

Explanation– $RX + Mg + \text{Dry ether} \rightarrow R - Mg - X$

Q2. Choose the incorrect statements about the Grignard reagent?

- a.) Grignard reagents ($RMgBr$) are reagents that add to the carbonyl group of aldehydes and ketones.
- b.) An organosodium compound is not very reactive as compared to a Grignard reagent.
- c.) Grignard reagents can be prepared in ether or tetrahydrofuran (THF).
- d.) Water and alcohol decompose Grignard reagents.

Correct Answer– (b.) An organosodium compound is not very reactive as compared to a Grignard reagent.

Q3. Which of the following compounds does not react with methylmagnesium bromide to produce tertiary alcohol?

- a.) 3-methylpentanal
- b.) Ethyl benzoate
- c.) 4,4-dimethylcyclohexanone
- d.) 4-heptanone

Correct Answer– (d.) 4-heptanone

Q4. ____ compound will give secondary alcohol on reacting with methylmagnesium bromide?

- a.) Butyl formate
- b.) 3-pentanone
- c.) Pentanal
- d.) Methyl butanoate

Correct Answer– (c.) Pentanal

Q5. By reacting magnesium with which compound, can Grignard's reagent be made?

- a.) Ethyl iodide
- b.) Diethyl ether
- c.) Methyl amine
- d.) Ethyl alcohol

Correct Answer– (a.) Ethyl iodide

Q6. What will be the product when 3-bromopropene is treated with $\text{CH}_3\text{CH}_2\text{CH}_2\text{MgBr}$?

Answer. The product will be Hexene when 3-bromopropene is treated with $\text{CH}_3\text{CH}_2\text{CH}_2\text{MgBr}$. The Grignard can easily attack the haloalkane to produce hexene as the bromine leaves.

Q7. Fill in the blank.

Grignard reagent behaves as ____.

Answer. Grignard reagent behaves as a strong base.

Q8. What is the final product of the reaction of the Grignard reagent with acetyl chloride?

Answer. The final product of the reaction of the Grignard reagent with acetyl chloride is Tertiary alcohol. For example- Benzoyl chloride reacts with two equivalents of methyl magnesium bromide, followed by acid hydrolysis, to form tertiary alcohol.

Q9. State True or False.

The Grignard reagent is also called as Organolithium halide.

Answer. False.

The Grignard reagent is also called as Organomagnesium halide.

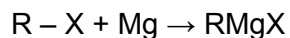
Grignard reagents are alkyl, vinyl, and aryl magnesium halides RMgX . They are also referred to as organomagnesium halides.

Q10. What happens when aldehyde reacts with Grignard reagent?

Answer. Organolithium or Grignard reagents react to alcohol in aldehydes or ketones with the carbonyl group $\text{C} = \text{O}$. Carbonyl substituents determine the essence of the alcohol component. The acidic work-up transforms the intermediate metal alkoxide salt into the desired alcohol by means of a simple acid-base reaction.

Q11. How is Grignard reagent prepared?

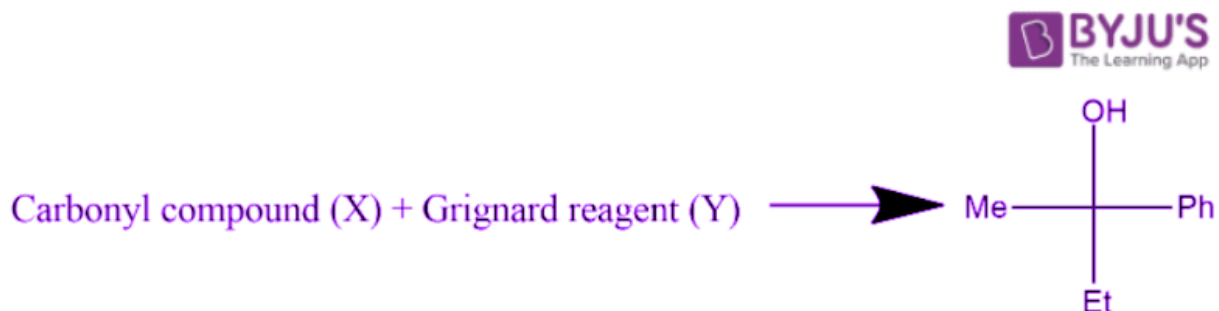
Answer. The Grignard reagent is an organomagnesium halide formed by reacting an alkyl halide with Mg in the presence of a suitable ether.



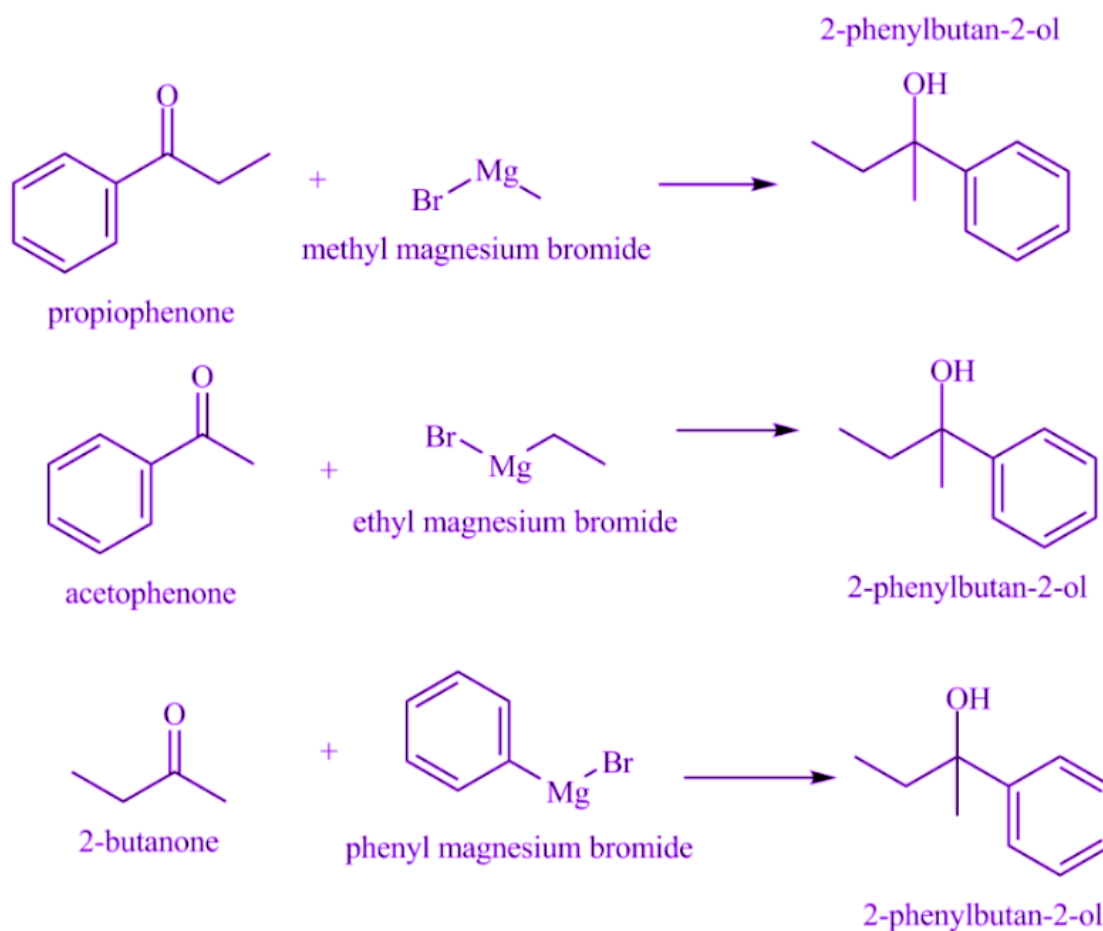
Q12. Which type of alcohol is formed when acetaldehyde reacts with the Grignard reagent?

Answer. When acetaldehyde reacts with Grignard reagent, and on subsequent hydrolysis, it yields secondary alcohol.

Q13. What can be X and Y in the below-given figure?



Answer. Three different R groups are present in the product. As a result, this product can be obtained by using three different carbonyl compounds and three different Grignard reagents. The following can be X and Y-



Q14. What is the overall mechanism for the reactions regarding the Grignard reagent?

Answer. They react with any proton source to produce hydrocarbons.

For example: $\text{RMgX} + \text{H}_2\text{O} \rightarrow \text{RH} + \text{Mg}(\text{OH})\text{X}$

Grignard reagent is most commonly used in nucleophilic addition reactions.

For example: aldehydes and ketones can be prepared from acyl chlorides. One of the most common Grignard reagent reactions is the synthesis of alcohols from aldehydes and ketones.

Q15. What functional groups are incompatible with Grignard reagents?

Answer. Alcoholic solvents and water are incompatible with Grignard reagents and organolithium reagents. Aldehydes, ketones, esters, amides, halides, $-\text{NO}_2$, $-\text{SO}_2\text{R}$, and nitriles are examples of reactive functional groups. Electrophilic or acidic functional groups cannot exist in the solvent or alkyl halides.

Practise Questions on Grignard Reagent

Q1. Which of the following is not present in the Grignard reagent?

- a.) Methyl group
- b.) Magnesium
- c.) Halogen
- d.) -COOH group

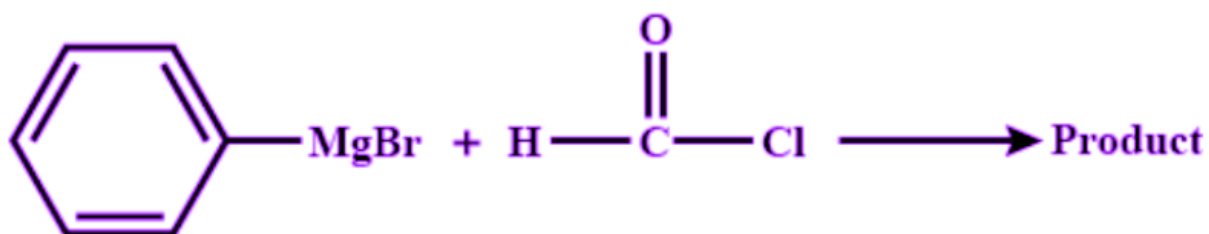
Correct Answer- (d.) -COOH group

Q2. When treated with phenylmagnesium bromide followed by acid workup, which of the following reagents will yield 2-phenylethanol?

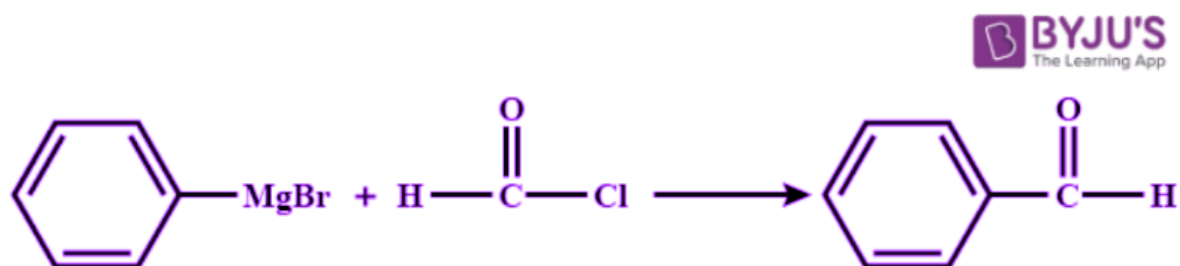
- a.) Oxirane
- b.) Diethyl ether
- c.) Ethanal
- d.) Ethanol

Correct Answer- (a.) Oxirane

Q3. Complete the reaction given below-

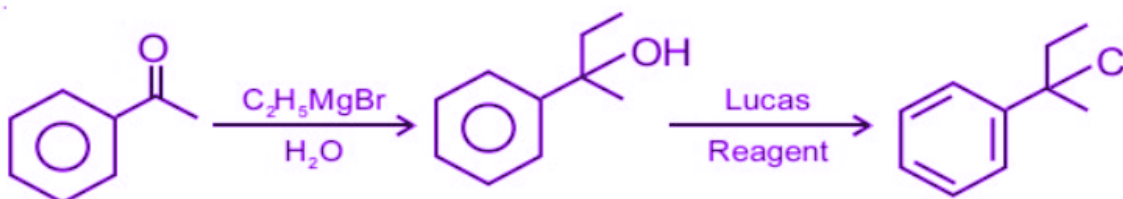


Answer.



Q4. The reaction of Grignard reagent, C_2H_5MgBr with C_8H_8O followed by hydrolysis gives compound "A" which reacts instantly with Lucas reagent to give compound B, $C_{10}H_{13}Cl$. Identify the Compound B is:

Answer. The compound B is $C_{10}H_{13}Cl$.



Q5. How is the carbon in the Grignard reagent able to bond to the carbon of an aldehyde/ketone?

Answer. The carbon–magnesium bond has the opposite polarity as the carbon–halogen bond of haloalkanes. Since a Grignard reagent's carbon atom has a partial negative charge, it resembles a carbanion and reacts with electrophilic centres such as the carbonyl carbon atom of aldehydes, ketones, and esters.