

## Chemguide – questions

### HALOGENOALKANES: GRIGNARD REAGENTS

1. Grignard reagents are made by adding a halogenoalkane to small bits of magnesium in a flask containing ethoxyethane (commonly called diethyl ether or just "ether"). The flask is fitted with a reflux condenser, and the mixture is warmed over a water bath for 20 - 30 minutes.

a) Write the structure for the Grignard reagent formed if you did this starting from

(i) 1-bromopropane,

(ii) 2-bromopropane.

b) Everything has to be perfectly dry because Grignard reagents react with water. Write the equation of the reaction between water and the Grignard reagent formed from 1-bromopropane.

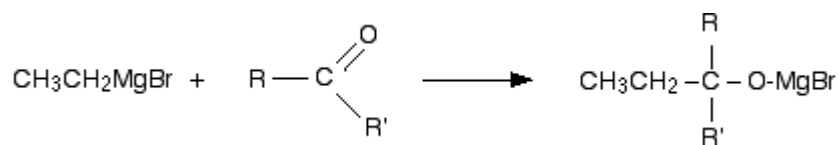
c) Explain the reason for using a reflux condenser, and the fact that the water bath mustn't be kept warm using a bunsen burner or any other naked flame.

2. a) Suppose you passed dry carbon dioxide through a solution of the Grignard reagent  $\text{CH}_3\text{CH}_2\text{MgBr}$  prepared as above.

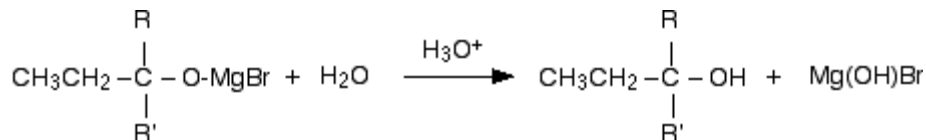
(i) Draw the structure of the initial product.

(ii) Draw the structure of the final organic product after this solution has been treated with water in the presence of a dilute acid.

b) Grignard reagents are used to make alcohols of varying complexity, by reactions with carbonyl compounds (compounds containing the  $\text{C}=\text{O}$  group). The Chemguide page gives the following general reactions starting from  $\text{CH}_3\text{CH}_2\text{MgBr}$ . R and R' are alkyl groups or hydrogen.



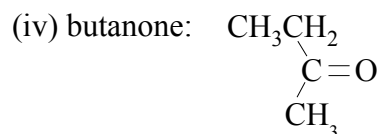
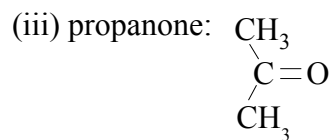
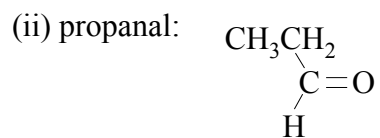
Adding acid to this gives



Draw the structures of the alcohols formed if you reacted  $\text{CH}_3\text{CH}_2\text{MgBr}$  with

(i) methanal:  $\begin{array}{c} \text{H} \\ | \\ \text{C}=\text{O} \\ | \\ \text{H} \end{array}$

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c) Using a Grignard reagent of your own choosing (not necessarily  $\text{CH}_3\text{CH}_2\text{MgBr}$ ), how would you make a sample of the alcohol 2-methylpropan-2-ol?

