

# Stability of Grignard Reagents

<https://gemini.google.com/app/df0a42a5d5ddadd1>

Response: To determine which compound will **not** yield a stable Grignard reagent as the final product when treated with  $\text{Mg}$  in dry ether, we examine the functional groups present in each option:

1. **Option (a)**  $\text{CH}_3\text{COCH}_2\text{CH}_2\text{Br}$ :

- Contains both a carbon-halogen bond ( $\text{C}-\text{Br}$ ) and a carbonyl group ( $\text{C}=\text{O}$ ).
- Although insertion of  $\text{Mg}$  into the  $\text{C}-\text{Br}$  bond initially generates an organometallic species, Grignard reagents react intramolecularly or intermolecularly with carbonyl groups ( $\text{C}=\text{O}$ ). As a result, it immediately undergoes reaction and cannot be isolated or exist as a stable Grignard reagent.

2. **Option (b)**  $\text{CH}_3\text{CH}(\text{NH}_2)\text{CH}_2\text{CH}_2\text{Cl}$ :

- Contains an acidic proton on the primary amine ( $-\text{NH}_2$ ).
- Any Grignard reagent formed is an extremely strong base and is rapidly quenched by acidic hydrogen atoms ( $-\text{OH}$ ,  $-\text{NH}_2$ ,  $-\text{COOH}$ , etc.), converting the organometallic intermediate into an alkane/amine salt rather than a Grignard reagent.

3. **Option (c)**  $\text{CH}_3\text{C} \equiv \text{C}-\text{H}$ :

- Does not contain a halogen atom ( $\text{Cl}$ ,  $\text{Br}$ ,  $\text{I}$ ) directly bonded to carbon.
- Without an alkyl or aryl halide,  $\text{Mg}$  insertion cannot occur to form a Grignard reagent ( $\text{RMgX}$ ).

## Conclusion / Multiple Choice Format:

Since **(a)**, **(b)**, and **(c)** all fail to form/yield a Grignard reagent as the final product (while **(d)**  $\text{BrCH}_2\text{CH}=\text{CH}_2$  forms allylmagnesium bromide successfully), compounds **(a)**, **(b)**, and **(c)** will not form a Grignard reagent.

If this is a standard multiple-choice question requiring a single option choice:

- **(a)**, **(b)**, and **(c)** are all correct choices for compounds that fail to yield a Grignard reagent.
  - If only one option can be chosen, **(c)** is the most fundamental non-reaction because it lacks a halogen entirely, whereas **(a)** and **(b)** undergo immediate decomposition/destruction via incompatible functional groups.
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