

Names of all students (please print) \_\_\_\_\_

Answer Key

CHEM 244 Organic Chemistry II

Points \_\_\_\_\_ (10 max)

**Worksheet #2a: January 29, 2025.** Complete the following worksheet by collaborating with the students in your group. You can use a text book or your lecture video notes. You must work together, with the names of all students included on **ONE** sheet and turned in for a group grade.

**PLEASE NOTE – Videos 12-3 and 12-4 require TWO class days of worksheets (WS-2a and WS-2b). Our class on Friday we will have worksheet 2b (no new videos), and we will start project work next week.**

**(1) Grignard Reaction True/False.** Are the following statements about Grignard Reaction True or False.

T The Grignard Reaction is a 3-step sequence that requires an alkyl halide, Mg, ether solvent, an “oxygen containing compound” (aldehyde, ketone, ester or epoxide), and aqueous acid.

F The Grignard Reaction has a carbocation intermediate.

T The Grignard reagent is best characterized as (1) a strong base, and (2) a good nucleophile.

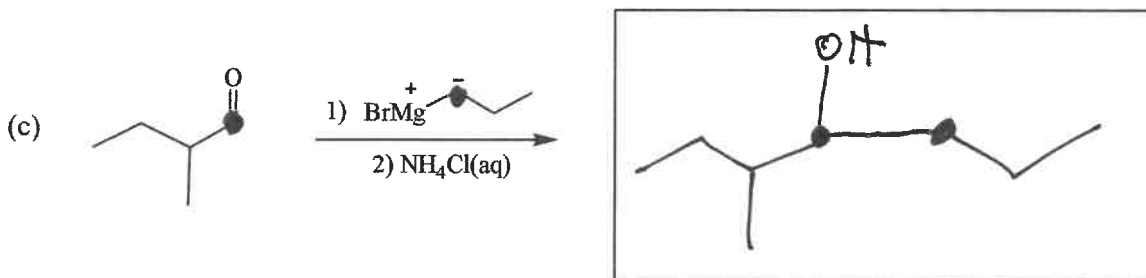
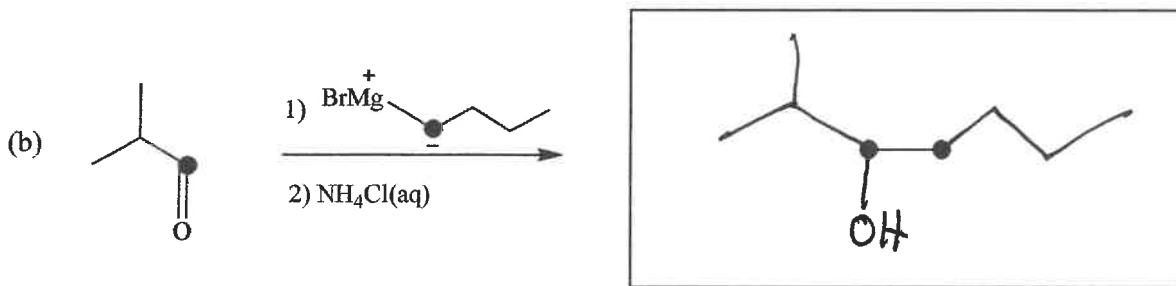
T The final product can be a 1°, 2°, or 3° alcohol.

F Water is the typical solvent when making the Grignard reagent.

**(2) Reactions used in the Grignard synthesis.** Fill in the boxes to give the correct structure of the alcohol product in the paired reactions shown below. In the first reaction in each pair, the “dots” represent where the new C-C bond will form and are to guide you in drawing the correct alcohol product. In the second reaction in each pair, the dots are not included.

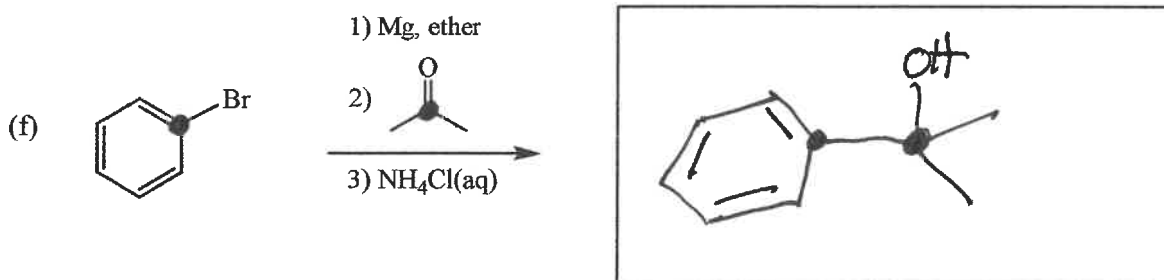
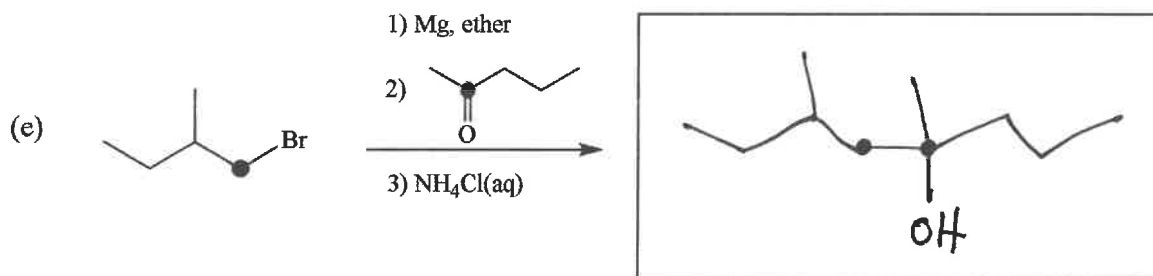
**I. Grignard Pair #1: Reaction of a Grignard Reagent with an Aldehyde.**

(a) When a Grignard Reagent reacts with an aldehyde, will the product alcohol be 1°, 2°, or 3°? Answer: 2°



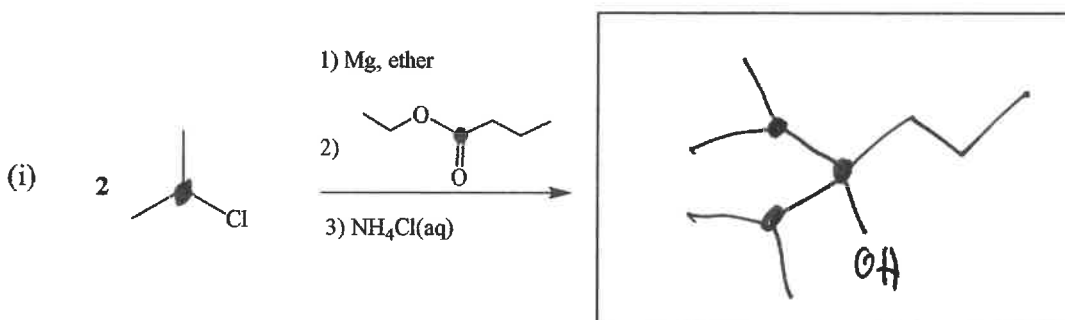
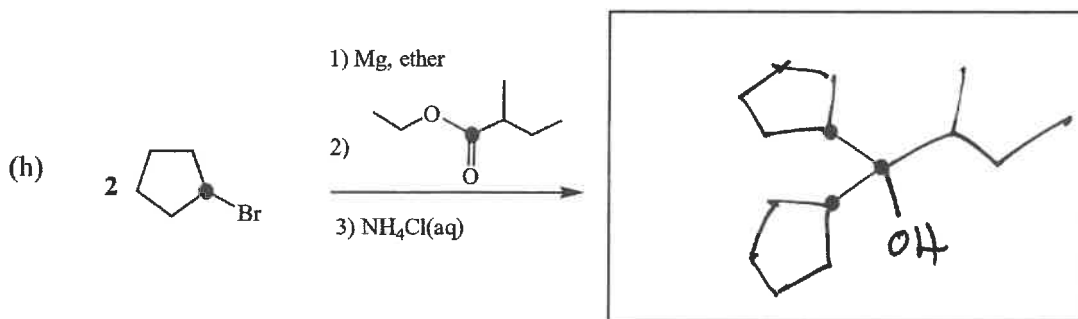
## II. Grignard Pair #2: Reaction of an Alkyl Halide with a Ketone.

(d) When a Grignard Reagent reacts with a ketone, will the product alcohol be 1°, 2°, or 3°? Answer: 3°

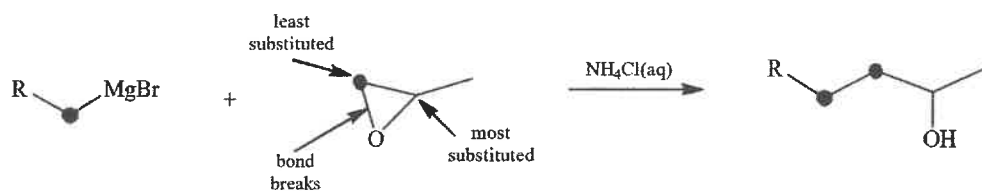


## III. Grignard Pair #3: Reaction of a Grignard Reagent with an Ester. NOTE: TWO molecules of the Grignard Reagent must add to ONE molecule of an ester.

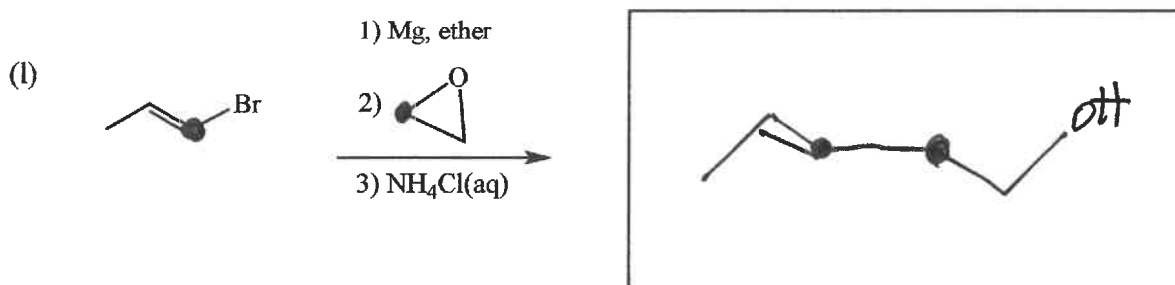
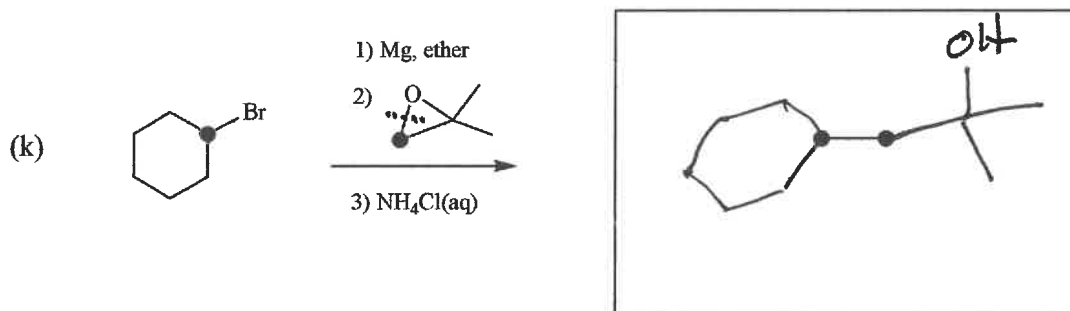
(g) When a Grignard Reagent reacts with an ester, will the product alcohol be 1°, 2°, or 3°? Answer: 3°



**IV. Grignard Pair #4: Reaction of an Alkyl Halide with an Epoxide.** NOTE: The Grignard Reagent adds to the least substituted carbon of the epoxide, and the -OH is on the most substituted carbon:



(j) When a Grignard Reagent reacts with an epoxide, will the product alcohol be 1°, 2°, or 3°? **Answer:** 1°, 2° or 3°



**(3) REVIEW: Alcohol Nomenclature.**

- If a name is given draw an accurate zig-zag structure (remember to use wedge and dash bonds for all chiral carbons).
- If a structure is drawn, give an accurate IUPAC name (don't forget to assign configurations using the R/S prefix).

**(2S, 4S)-1-cyclopropyl-4-methyl-2-hexanol**

