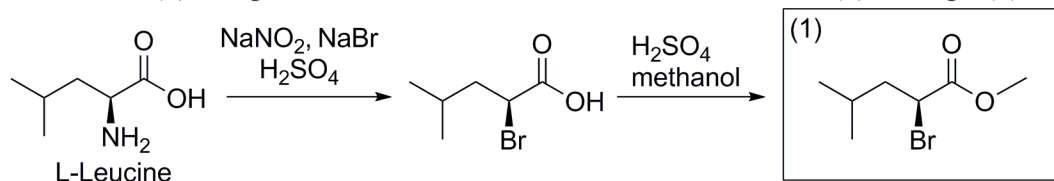


Polymerized amino acids are potential peptide mimics that may have application in medicinal chemistry. A general synthetic method for the preparation of β -amino acids was reported in the Journal of Organic Chemistry in 2006. Two steps in the reported synthetic route are shown in the scheme below, where L-Leucine (an α -amino acid) is first converted to (S)-2-bromo-4-methylpentanoic acid. The second step utilizes general reaction conditions also seen in Chemistry 216. The procedure requires 250 mg of 2-bromo-4-methylpentanoic acid (mol. wt. 195.05 g/mol), 0.04 mL of concentrated H_2SO_4 (mol. wt. = 98.08 g/mol, $d = 1.84 \text{ g/mL}$), and 2.6 mL of methanol (mol. wt.=32.04 g/mol, $d = 0.791 \text{ g/mL}$) Show the product of the reaction in box (1) and perform the calculations described below in (2) through (5).



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2. Calculate the molecular weight of L-Leucine. Use the following atomic weights: H 1; C 12; O 16; and N 14 a.m.u.

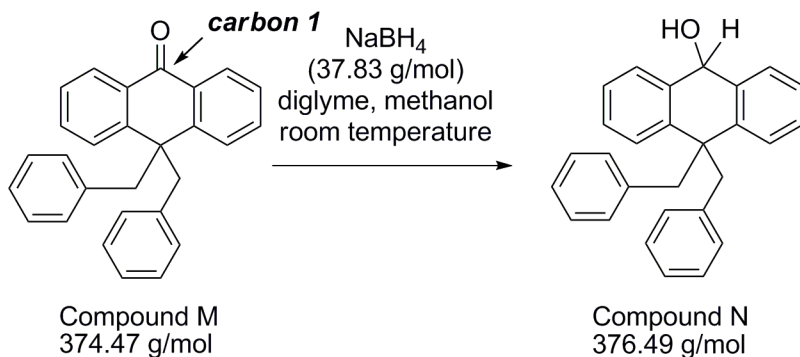
3. Calculate the mmol and molar equivalents of each 2-bromo-4-methylpentanoic acid, H_2SO_4 and methanol. Show your work for partial credit.

4. What is the limiting reagent in this reaction? Explain.

5. Assume that only 70% yield is expected for the reaction. If you wish to obtain ~500 mg of product, how much 2-bromo-methylpentanoic acid should you start with?

first determine the theoretical yield (at 100%) needed to obtain an actual yield of 0.500 g:

The following reaction was reported in *J. Org. Chem.* 2011, 76, 5531:



The following experimental description corresponds to the reaction above:

Compound M (3.0 mmol) was dissolved in diglyme (12 mL) before NaBH_4 (9.1 mmol) was added. After stirring for 30 min at room temperature, methanol (6 mL) was added dropwise. The mixture was stirred for another 10 min, and then a second portion of NaBH_4 (4.5 mmol) was added. The reaction was monitored by TLC. After about 4 h, water was slowly added under vigorous stirring in an ice-water bath (quenching of the reaction). Compound N was obtained by filtration as colorless crystals in 98% yield.

Using the mmol provided in the experimental above calculate the grams used for each reagent and put your final answer in the box provided. Note that NaBH_4 was added in two portions and Molecular weights are given above.

Compound M:

NaBH_4 (total):

What was the limiting reagent in this reaction?

The percent yield for the reaction was 98 %. How many grams of Compound N were obtained?