

“Greening up”: A Multistep Synthetic Transformation

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Green Chemistry is an experimental design theory that aims to reduce the use and generation of hazardous substances in order to address problems we face in the world today like water contamination, global warming, ozone depletion, and pollution. When hazardous substances are replaced with less hazardous substances, both risk and cost can be reduced. Teaching the importance and relevance of green chemistry is imperative to the future of chemistry and the environment. Since most useful organic chemical targets require more than one synthetic step, it is important that undergraduate organic chemistry students be exposed to labs that require multiple transformations. This will allow students to understand how reactions work after observing them first-hand. Additionally, since the ‘traditional’ synthesis of most chemical substances utilizes solvents, reagents, and conditions that are harmful and hazardous to the environment, students had to propose their own green alternatives by completing a 3-step synthesis and determining a greener route. The products were purified, characterized and then a metric system was used to compare the greenness of the reactions. A reaction was considered more green if there were relative decreases in the combination of factors that include cost, environmental toxicity, and waste produced. In total, 22 different targets were attempted to be synthesized.