**Comparison of Traditional and Green Chemistry Methods for Extracting Essential Oils from Spices**

**A Laboratory Activity for Science Majors Taking Organic Chemistry**

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*Student Handout*

**Steam Distillation and Liquid CO2 Extraction of Essential Oils from Spices:**

**A Comparison of Traditional and Green Chemistry Methods**

(Experiment 57A and B in PLKE plus Handout for Liquid CO2)

## **Reading Assignment**

* Background (p.502-504)
* Experiment 57A and B (p.504-508)
* Essay (p.108-111)
* Technique 12, Review (p.669-693)
* Technique 18 (p.750-755)
* Technique 22, Section 22.14 (p.816-817)
* Technique 28 (p.924-942)
* Liquid CO2 Handout
* Essay (p.268-273)
* Technique 25 (p.833-866)

## **Pre-lab**

* Prepare your notebook as described in the lab notebook handout. Include: name, date, title, purpose (be specific).
* Make flow charts for the steam distillation and the liquid CO2 extraction (go from spice to oil; components at each step go into boxes, and techniques used go over the arrows connecting the boxes; each step has a branch for what’s kept and what’s discarded).

**Report**

This is a formal, journal-style report and should be typed (1.5 or 2 spaced)

* Include the following (in this order):
  + Abstract (summarizes entire report; no more than 1/2 page)
  + Introduction (relevance of experiment, history, applications, etc.)
  + Experimental Methods (concise summary of procedures and reasoning)
  + Results (your results; theoretical and percent yields with calculations, IR’s and GC-MS spectra with peaks labeled)
  + Discussion (interpretation of your results, including IR and GC—MS results, comparison of results to literature results, interesting observations, sources of error, etc.). Include discussion on the green chemistry vs. traditional methods. Compare in terms of yield, composition, purity, safety (and human health), and environmental impact. \*Note: Results and Discussion may be combined into one section.
  + Conclusions (brief concluding paragraph; was the experiment successful? Is green chemistry better?)
  + References (should also be cited throughout text where appropriate; need at least three primary literature references)
* Note: look at journal articles in publications such as Journal of Organic Chemistry (JOC), Journal of American Chemical Society (JACS) and Journal of Chemical Education (JCE) to get an idea of the style of writing and format of these types of papers; look at several abstracts to get an idea of how these are written.