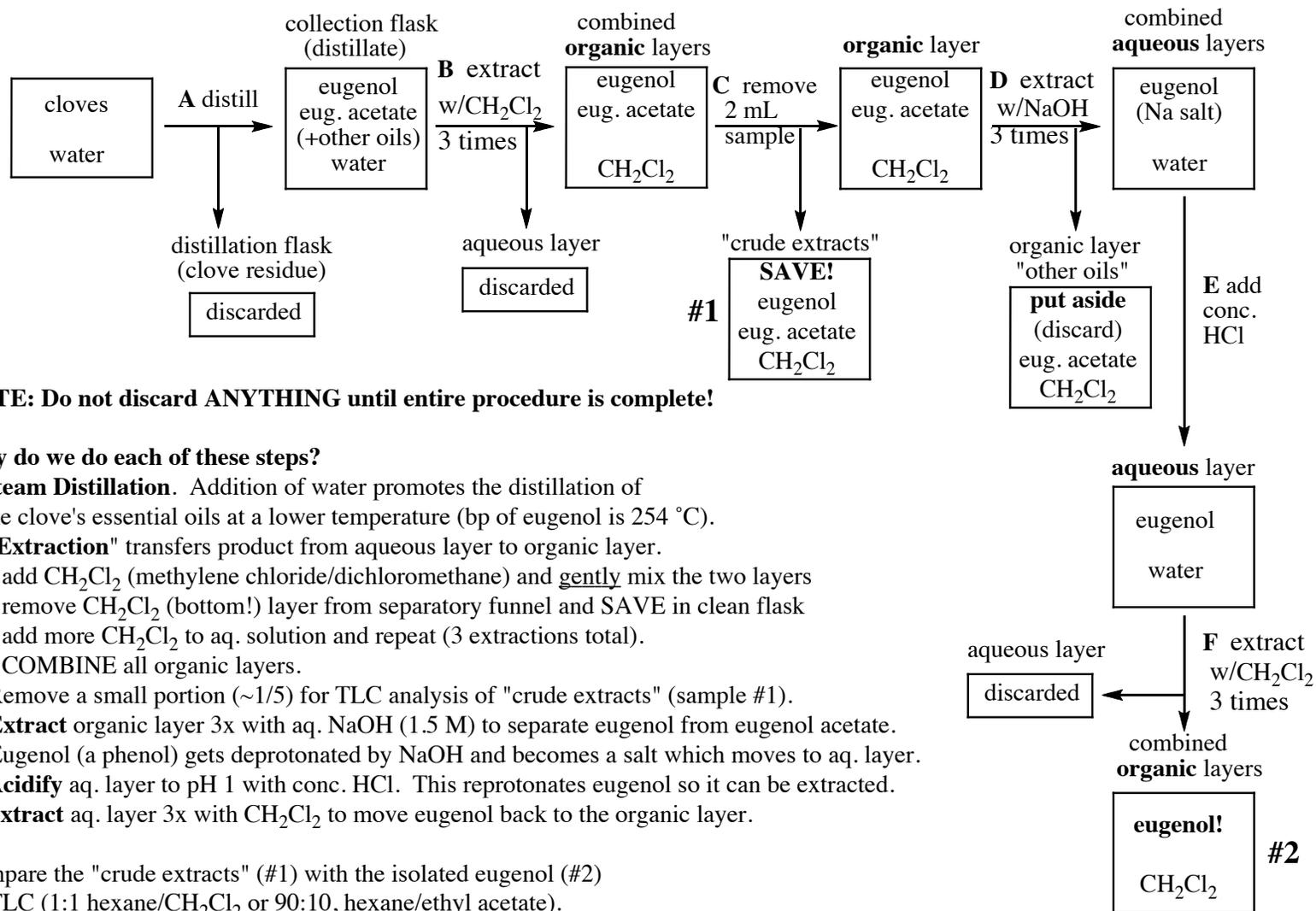
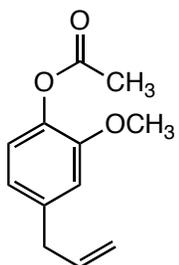
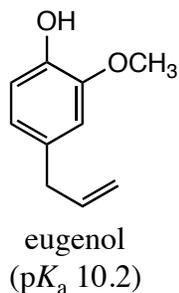


California State Polytechnic University, Pomona  
 Dr. Laurie S. Starkey, Organic Chemistry Lab, CHM 319L  
**Isolation of Eugenol from Cloves**



**NOTE: Do not discard ANYTHING until entire procedure is complete!**

**Why do we do each of these steps?**

- A Steam Distillation.** Addition of water promotes the distillation of the clove's essential oils at a lower temperature (bp of eugenol is 254 °C).
- B "Extraction"** transfers product from aqueous layer to organic layer.
- add  $\text{CH}_2\text{Cl}_2$  (methylene chloride/dichloromethane) and gently mix the two layers
  - remove  $\text{CH}_2\text{Cl}_2$  (bottom!) layer from separatory funnel and SAVE in clean flask
  - add more  $\text{CH}_2\text{Cl}_2$  to aq. solution and repeat (3 extractions total).
  - COMBINE all organic layers.
- C** Remove a small portion (~1/5) for TLC analysis of "crude extracts" (sample #1).
- D Extract** organic layer 3x with aq. NaOH (1.5 M) to separate eugenol from eugenol acetate. Eugenol (a phenol) gets deprotonated by NaOH and becomes a salt which moves to aq. layer.
- E Acidify** aq. layer to pH 1 with conc. HCl. This reprotonates eugenol so it can be extracted.
- F Extract** aq. layer 3x with  $\text{CH}_2\text{Cl}_2$  to move eugenol back to the organic layer.

Compare the "crude extracts" (#1) with the isolated eugenol (#2) by TLC (1:1 hexane/ $\text{CH}_2\text{Cl}_2$  or 90:10, hexane/ethyl acetate).

Did this acid/base extraction technique successfully separate eugenol from the other essential oils?

Flash-based complete extraction tutorial:



Please review the Extraction tutorial, especially the section on Planning an Acid-Base Extraction (<http://tiny.cc/u43djy>).

(all lab technique tutorials can be found at <https://www.youtube.com/user/ChemistryConnected>)

Extraction playlist acid-base is Part 7:

