**The two nail puzzle problem: An Exercise in Thinking Like an Organic Chemist**

**Overview**

Most beginning students equate mastering organic chemistry with accurately recalling the massive body of information contained within the topic. As a result organic chemistry is generally viewed as being `all about memorization’ and students adopt study patterns that are little more than variations on rote cramming

Some common sense reflection exposes the fallacy of this approach. If memorization equals mastery, then the best poets and mathematicians are individuals who have memorized the biggest dictionaries, or have retained the most number of formulas and proofs. Frankly, such a view is just plain dumb. Like a fine poet or an inspired mathematician, good organic chemists do more than just regurgitate information.

What really constitutes the central theme of organic chemistry is the subtle and unique approach taken by organic chemists in exploring and rationalizing molecular interaction. It is rarely admitted, but much of the science of organic chemistry is at bottom an informed and sophisticated `feel’ for organic molecules and reactions. To impart this `feel’ most organic chemistry professors immerse (some would say drown) students in as many examples and cases of organic reactions as can be packed into each lecture. While such a `sink or swim’ approach guarantees that the body of organic chemistry is crammed down throats, it is rare that the underlying spirit of the craft is absorbed in the process.

The object of this lab is to exercise two major cognitive skills involved in thinking like an organic chemist: ***spatial reasoning*** and ***abstracted*** ***visual expression*** of this reasoning . Because the problem is non-chemical , you should be able to experience which mental muscles are stretched as you solve and explain your solution without the psychological baggage connected with organic chemistry. Once you know the `feel’ of the process, it should be easier and less difficult to think like an organic chemist. ( At least that’s the instructor’s pathetic hope…)

**The Task (25 lab points)**

**By Friday 28 October in class:**

**a) as a team *devise a method (e.g. a `mechanism) to separate the two nails that are located in 320 PHS using just your hands, and which leaves the individual nails unchanged*) . You can `borrow’ the nail sets if you sign-out for them.**

***b) describe your “mechanism” for achieving this separation in writing and with accompanying sketches in your own words.***

With regard to part b, you are strongly encouraged to follow the format generally adopted in explaining organic mechanisms, e.g.:

* devise a simplifying pictorial model of the nails in their combined and separated states
* describe the mechanism of separation ***in*** ***stepwise fashion*** using the model and a combination of sketches and text.

The `best’ mechanistic descriptions also provide a clear statement of the overall idea that underlies the mechanism as well as self-evident pictures.

**Warnings**

1) It is expected that you will tackle this problem on your own as a team and without using outside sources. The entire intent is for you to stretch your own personal mental muscles. **Do not**- repeat- **do not** just run to the Internet, for a solution. The instructor is familiar with most-if not all –the sources there and will summarily fail any team that demonstrably copies from those sources, or, from other students.

2) be prepared to share your `mechanisms’ with other students. We will be exchanging papers in class and part of your grade will depend on how successful fellow students are in using just your description to separate the two nails.