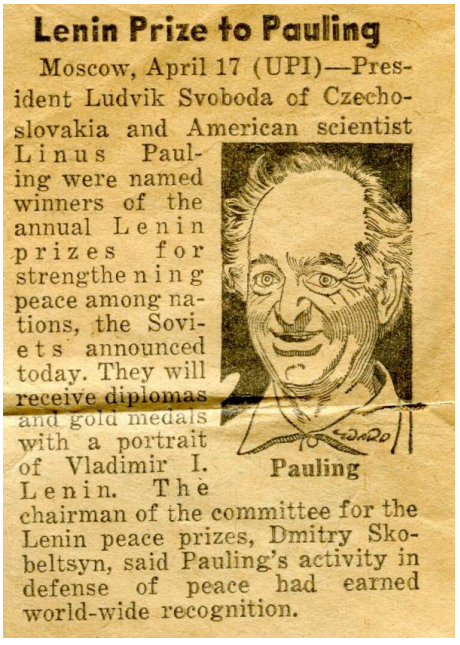
Chemistry 41c
FIRST QUIZ KEY
April 12, 2013

Name (print)___ANSWER KEY_____

Note: You have 40 minutes to take this quiz. This exercise is to be worked alone and is closed book, closed notes, and no electronic devices are allowed.



Lenin Prize to Pauling

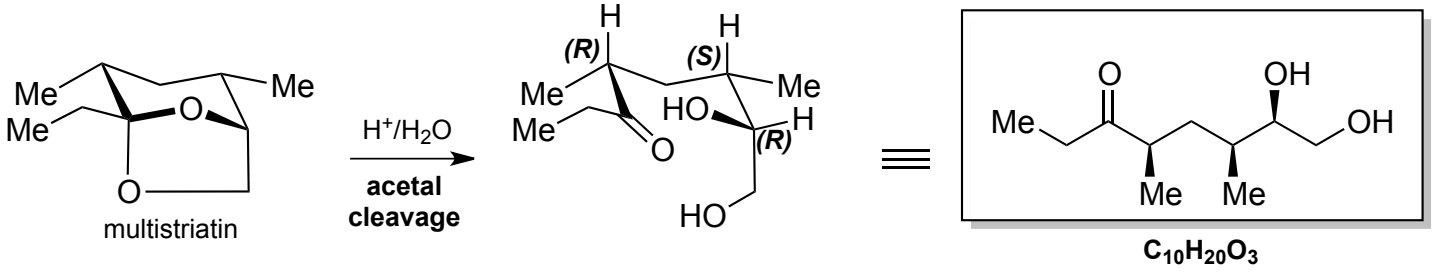
Moscow, April 17 (UPI)—President Ludvik Svoboda of Czechoslovakia and American scientist Linus Pauling were named winners of the annual Lenin prizes for strengthening peace among nations, the Soviets announced today. They will receive diplomas and gold medals with a portrait of Vladimir I. Lenin. The chairman of the committee for the Lenin peace prizes, Dmitry Skobeltsyn, said Pauling's activity in defense of peace had earned world-wide recognition.

Pauling

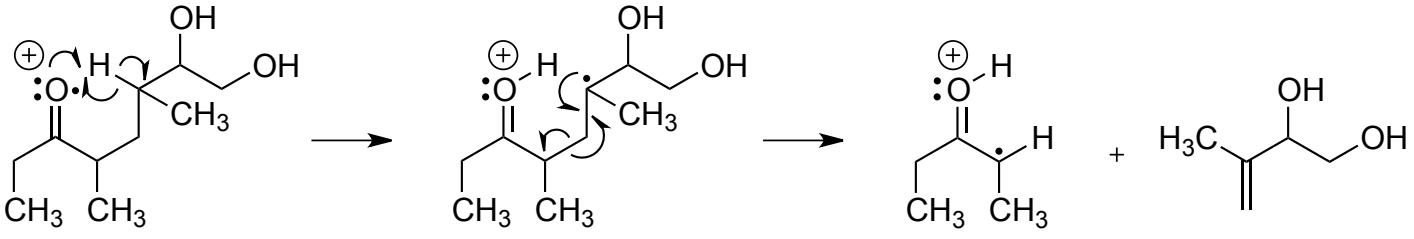
Turns out the Soviet Union had an ideological problem with resonance theory, going so far as to denounce it as pseudo-scientific. *As the dynamics of Soviet dogma evolved, the enmity surrounding the so-called resonance controversy simmered down, and by the late 1960s Pauling had gone from being a disparaged name in Soviet chemistry to a respected scientist and much-admired advocate of nuclear test bans and international peace.** For these efforts he was awarded the Lenin Prize in 1970.

*http://paulingblog.wordpress.com/2009/03/31/pauling-and-the-soviet-union-in-the-1960s-and-1970s-the-thawing-of-frosty-relations/

1. Treating multistriatin with dilute aqueous acid leads to the formation of a product, $C_{10}H_{20}O_3$, which shows a strong infrared peak near 1715 cm^{-1}, a ^{13}C resonance at 200 ppm, and a significant electron-impact MS fragment at 86 m/z. Write down a sterechemically correct representation of the product and use additional structures, if necessary, to explain the origin of the spectroscopic data. (6 pts)



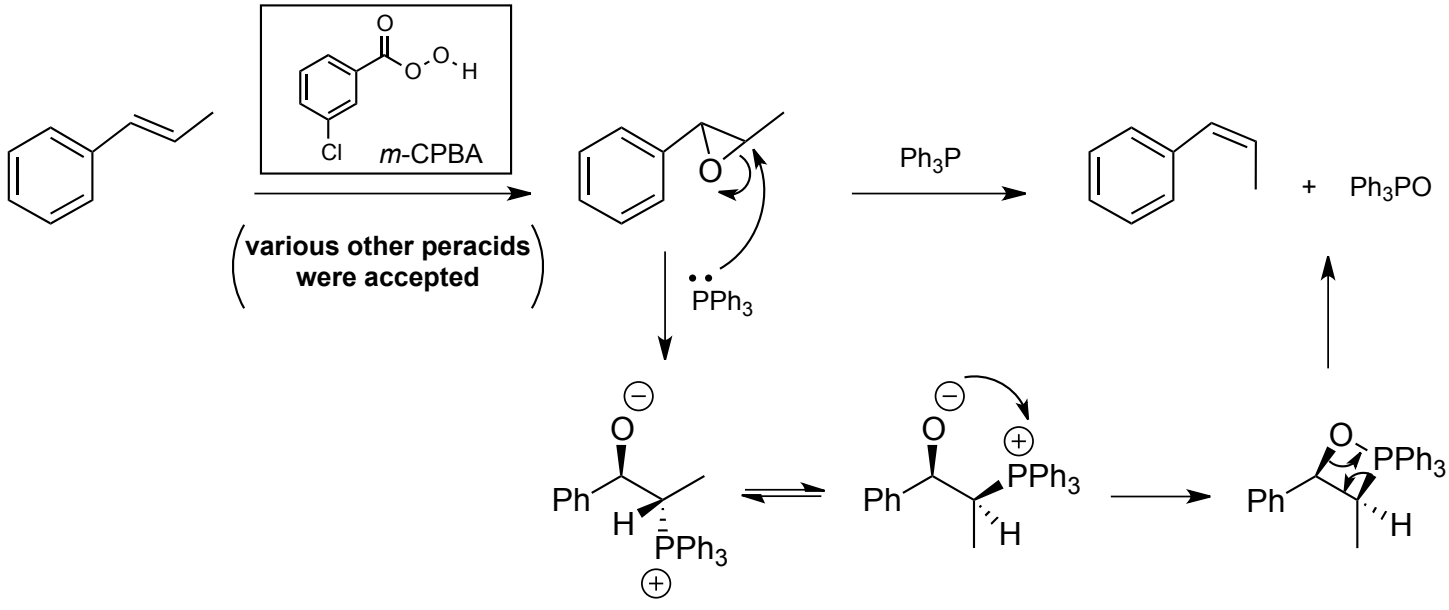
IR peak at 1715 cm^{-1} and ^{13}C NMR signal at 200 ppm indicate a carbonyl group in the product. The MS data can be explained by a McLafferty Rearrangement:



Bonus (1 point): how many pairs of diastereotopic protons are there in multistriatin? **3 pairs**

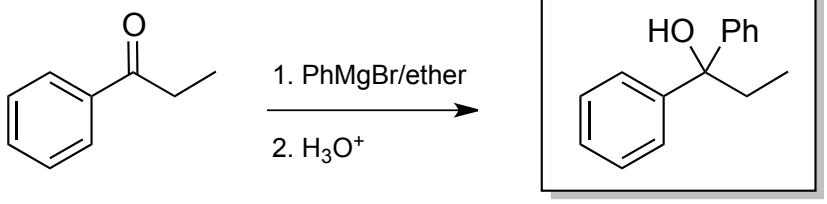
2. Triphenylphosphine can be used in a two-step process to convert *E* alkenes to *Z* alkenes or vice-versa. In this example, the *E* starting material is first converted to the epoxide, which is then treated with Ph_3P. Propose a likely mechanism, using well-drawn and stereochemically correct structures, for the phosphine-mediated part of the process. (4 pts)

Bonus (2 points): in the box, draw the structure of a reagent for converting the alkene to the epoxide.

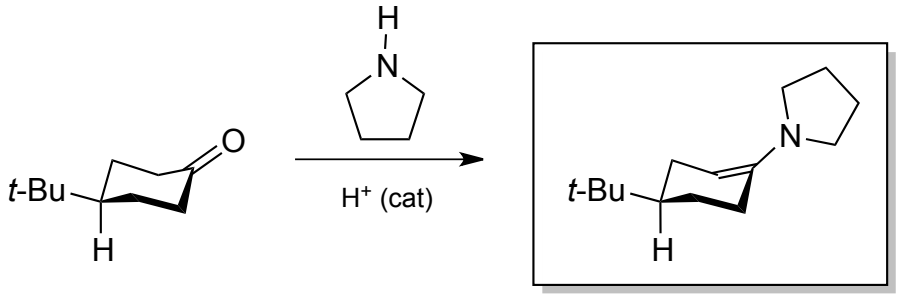


3. Predict the principal products expected (if any) for the following reactions. For each, draw a circle or box around the structure you want to be evaluated. (2 pts each)

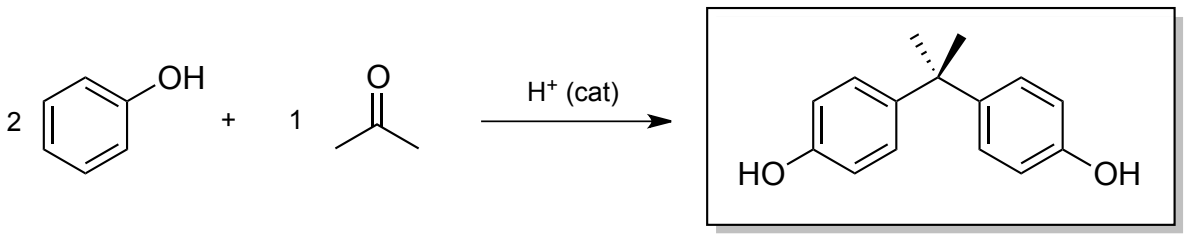
a)



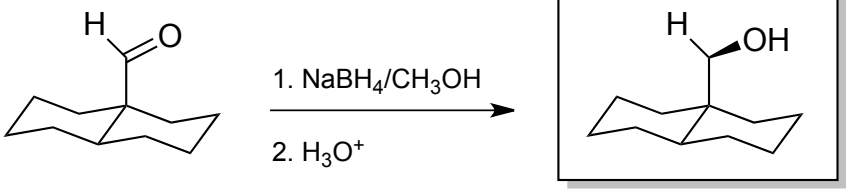
b)



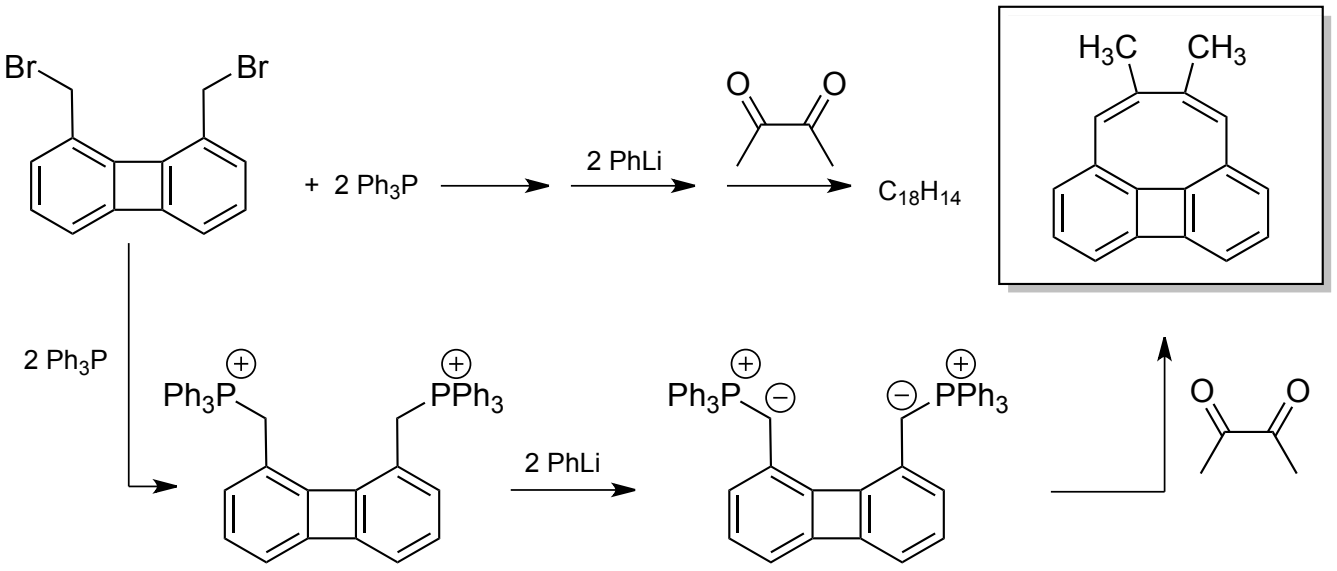
c)



d)

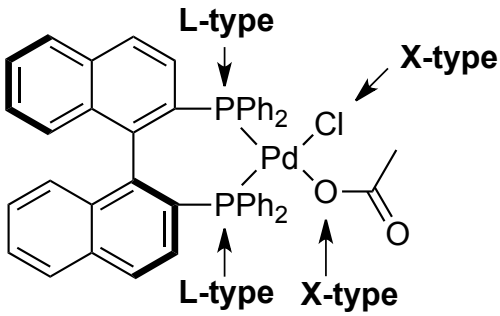


e)



4a. For the following complex, classify each of the ligands, and provide the oxidation state of the metal. (4 pts)

Bonus (1 point): What is the d-electron count of this complex? **d^8**



Pd^{II}

4b. Fill in the boxes in the following catalytic cycle. (6 pts) **Heck Reaction**

Bonus (1 point): What is the name of this reaction?