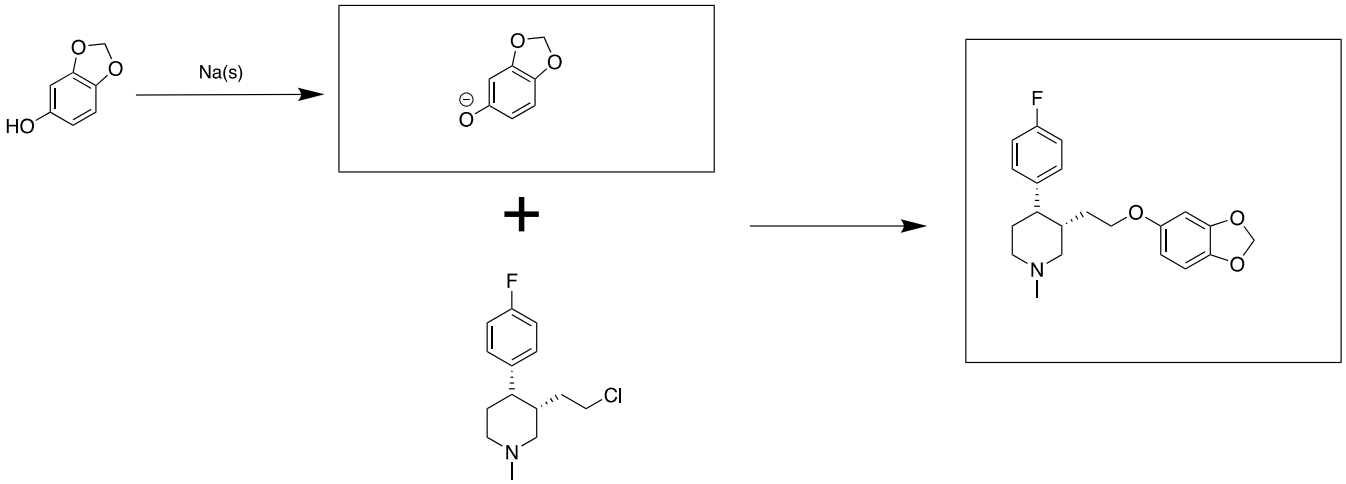
Honor Statement:

On my honor and character, I confirm that I am adhering to all academic codes of conduct. This includes, but not limited to: not consulting with any other students or individuals at any time during exam availability, not using any other websites/textbooks besides the ebook and CCLE, not using any apps/communication platforms whatsoever. **I am fully aware that academic dishonesty will not be tolerated and is subject to severe disciplinary actions**.

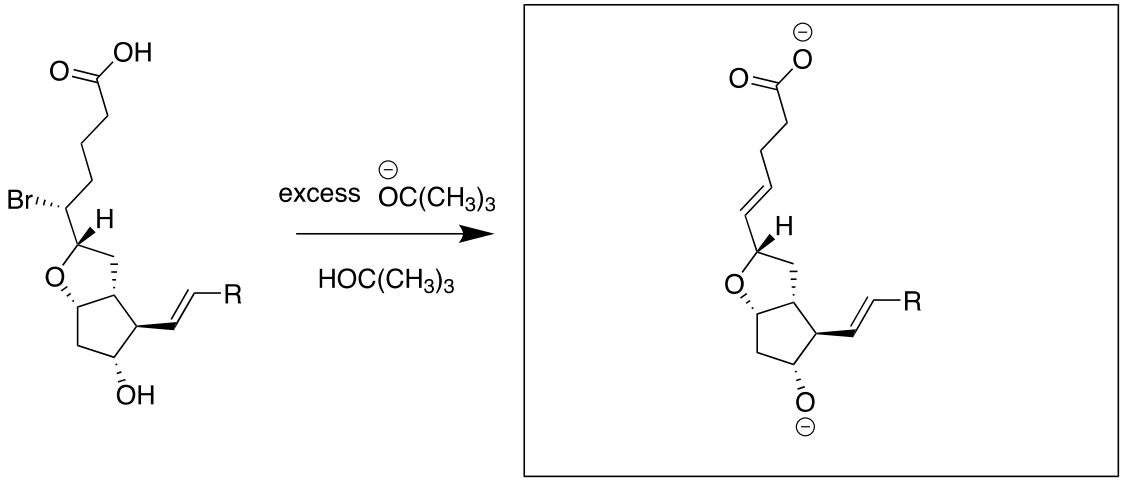
Sign here:

1. For each of the following reactions, draw the major product(s) in the box after each step. (5 pts)

a) The following is a route for the synthesis of an antidepressant similar to Prozac and Zoloft.



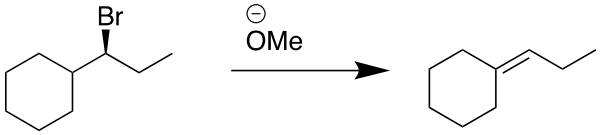
b) The following is a step in the synthesis of a biomolecule that is involved in regulation of pain, fever, and inflammation. Draw the biomolecule from the reaction shown. “Excess” implies that multiple reactions can occur on the same substrate.



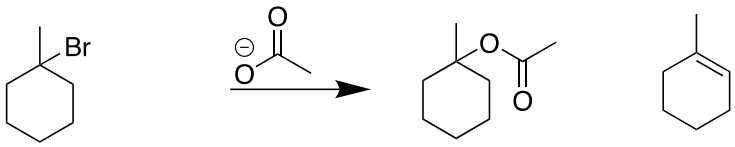
2. For each reaction: (21 pts)

- Draw the final major product(s).
- Determine if the reaction will go faster when the concentration of the nucleophile/base is doubled. Place an "X" in the box under "faster" or "no effect". No credit will be given if both boxes are marked.

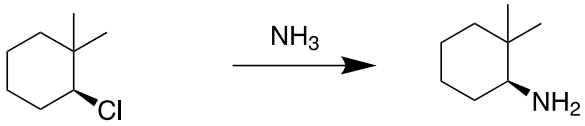
faster



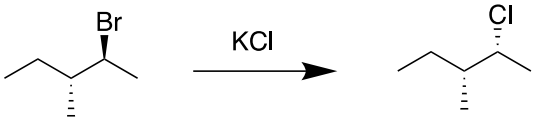
faster



no effect

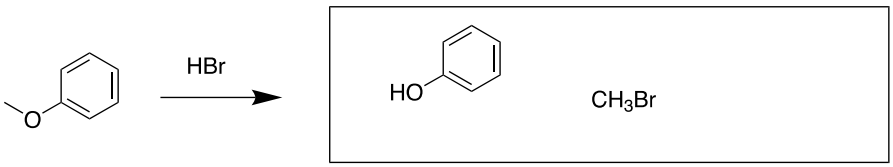


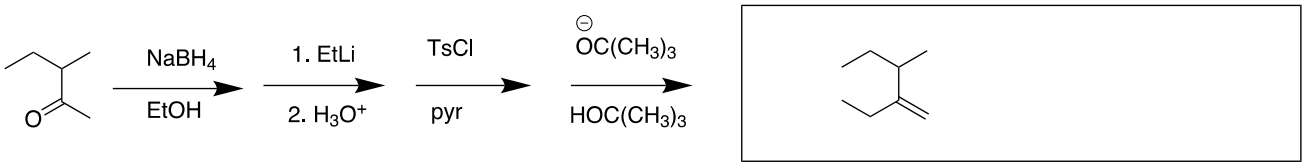
faster



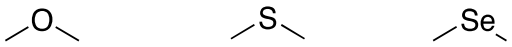
faster

3. Draw the final major product(s) for each reaction: (7 pts)





4. Rank the following compounds within each series by nucleophilicity in water. Use a "1" for the most nucleophilic, followed by a "2", and a "3" for the least nucleophilic. (9 pts)

a) 

3	2	1

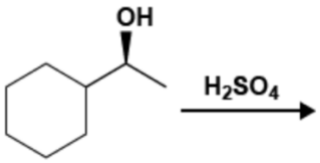
b) Br^{1-} Cl^{1-} I^{1-}

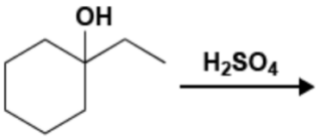
2	3	1

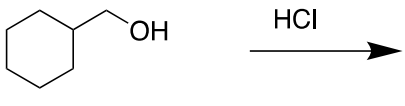
c) H_2N^{1-} H_2O NH_3

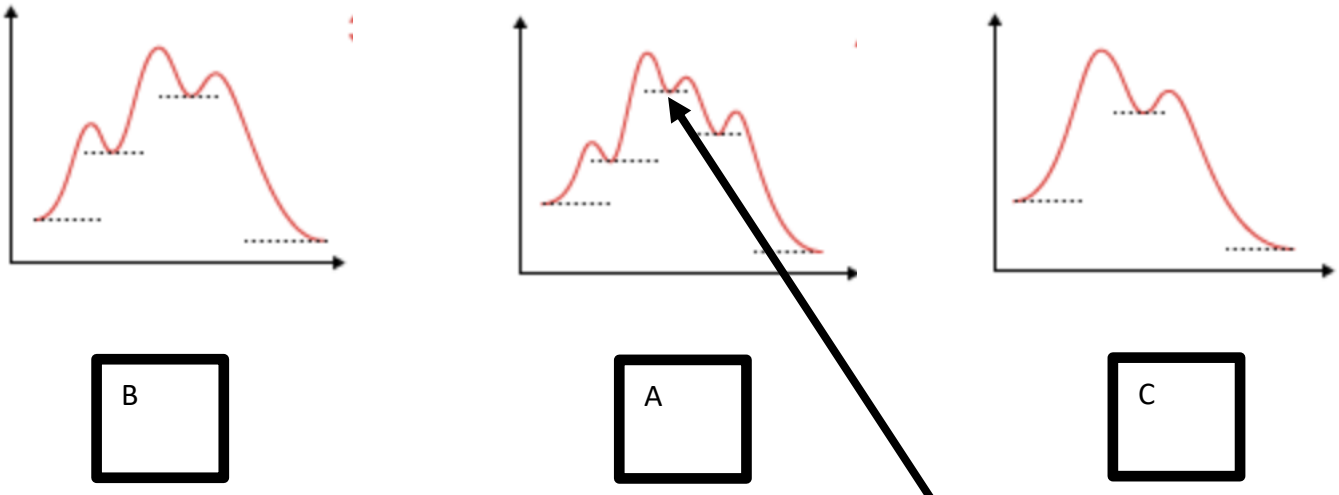
1	3	2

5. Match the following reactions to the correct energy diagram. Write the letter of the reaction in the box underneath its correct diagram. (8 pts)

A) 

B) 

C) 

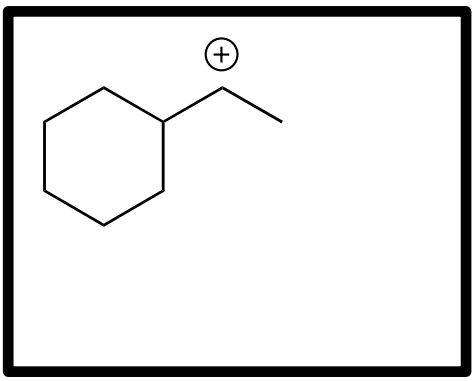


B

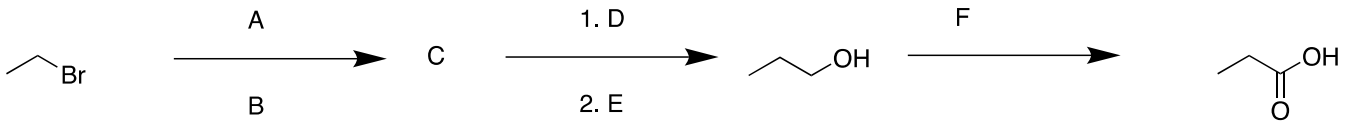
A

C

For the middle energy diagram, draw the structure which occurs at the indicated point (highest dotted line).



6. Identify A through F. Draw the structure in the designated box. (12 pts)



A

Mg

B

Et_2O

C

$CH_3\overset{\ominus}{\underset{\cdot\cdot}{C}}H_2$

D

CH_2O

E

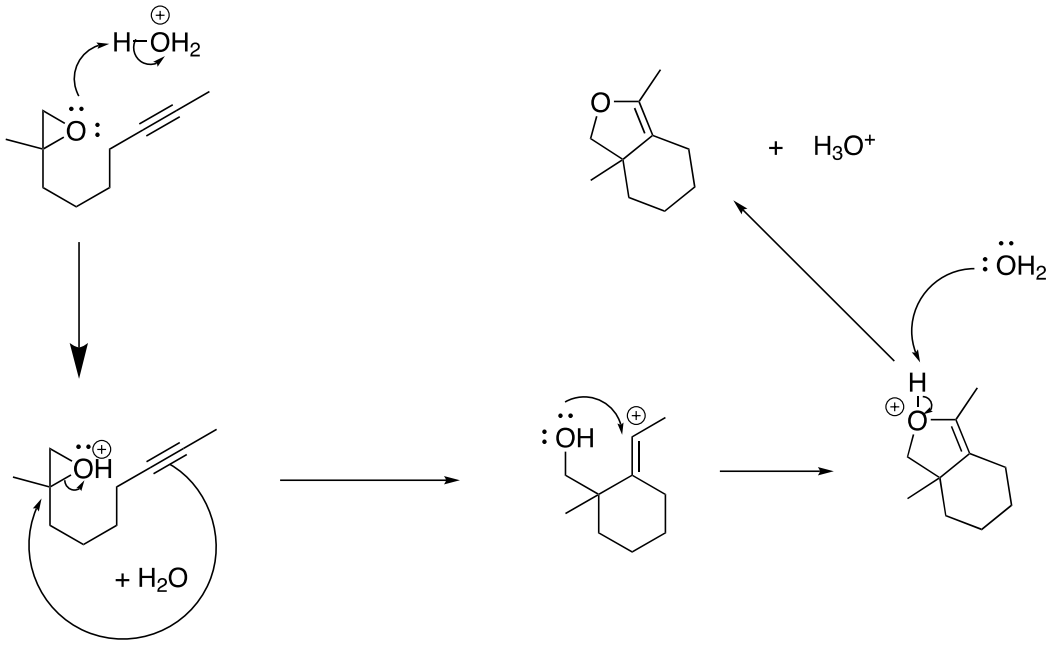
H_3O^+

F

Any Cr oxidizing agent except PCC

7. Use curved arrows and propose a mechanism for the following acid-catalyzed reaction. Draw the intermediate after each step. No other reagents are used. (14 pts)

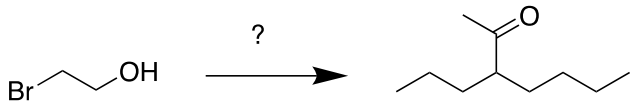
Hint: The alkyne is very electron rich due to its π bonds.



Place an "X" in the box of the intermediate(s) formed in your mechanism.

alkoxide	carbocation	oxonium	none
☐	☒	☒	☐

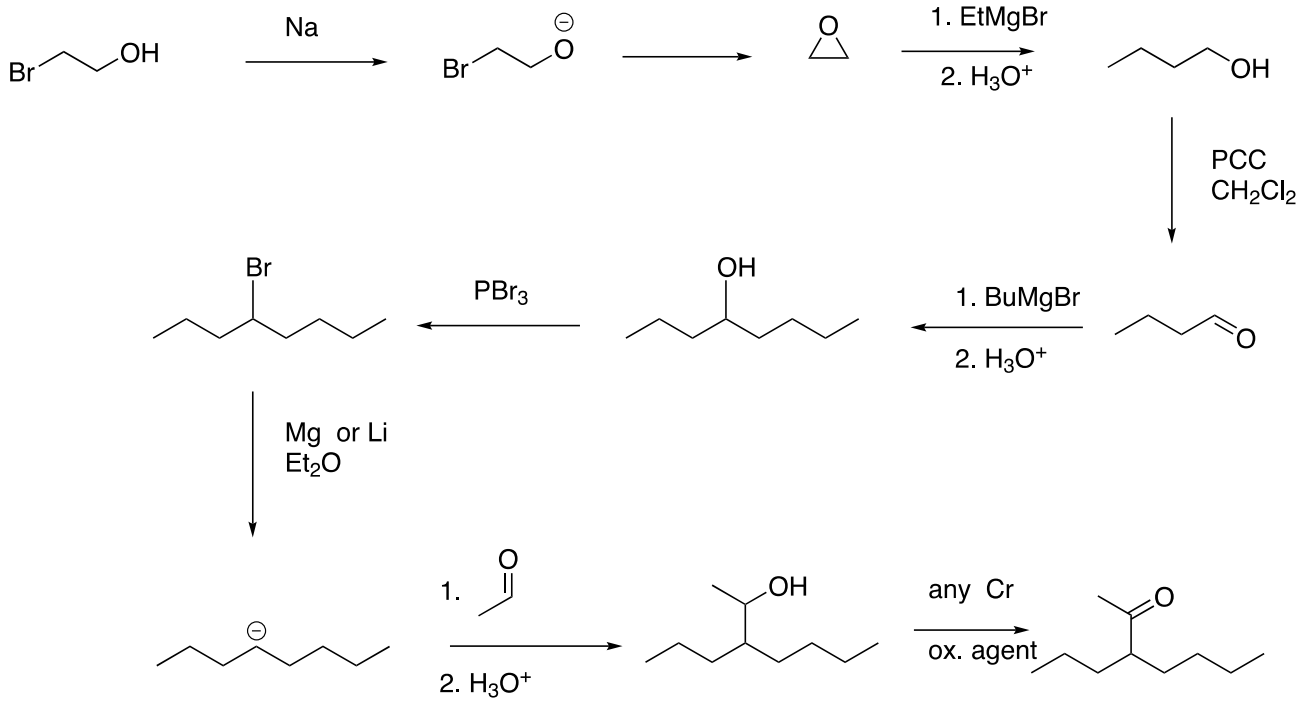
8. Propose a multistep synthesis to successfully carry out the following transformation. Supply all required reagents and draw the intermediate product after each step. You do not have to use curved arrows to show electron movement. (24 pts)



Guidelines (no credit if not adhered to):

- At some point during the synthesis, 1-butanol must be formed and used as a reagent in the subsequent step.
- There are no carbocation intermediates formed at any time during the procedure.
- Grignard/organolithium reagents cannot directly react with or be formed from a compound that has both a leaving group and an OH group attached.

If you are unable to show how to form 1-butanol from the starting material while adhering to the guidelines, just start with 1-butanol and make the target product to receive partial credit.



Continue onto the next page …

For Gradescope sorting purposes, mark one of the following boxes:

I was able to complete the entire synthesis. ☐

I started with 1-butanol and formed the product. ☐

None of the above. I did a little here and there. ☐

Write your final answer as a multistep synthesis, e.g. second problem of Question 3:

A → → → ... → B , filling in just the required reagents for each arrow.