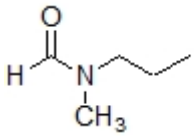
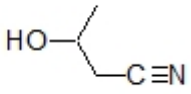
I. Nomenclature

1. Draw structures for each of the following compounds listed below. (4 points)

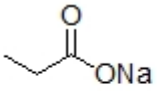
phthalic acid -bromo- -valerolactone

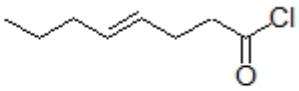
2. Provide common names for each of the following structures. (6 points)

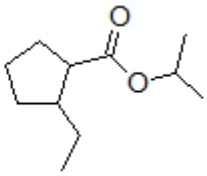




3. Use IUPAC rules to name each compound below. (9 points)

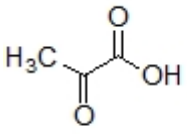




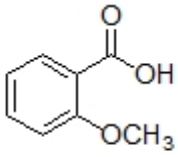


II. Theory

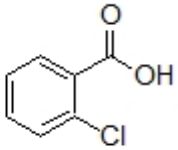
1. Which sequence ranks the following acids in order of increasing acidity? (3 points)



1



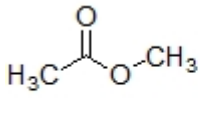
2



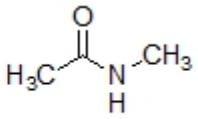
3

a) 1<2<3 b) 2<3<1 c) 3<1<2 d) 3<2<1 e) 2<1<3 f) 1<3<2

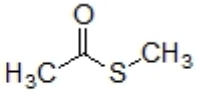
2. Which sequence ranks the following carboxylic acid derivatives in order of increasing rate of hydrolysis? (3 points)



1



2



3

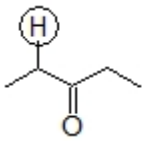
a) 1<2<3 b) 2<3<1 c) 3<1<2 d) 3<2<1 e) 2<1<3 f) 1<3<2

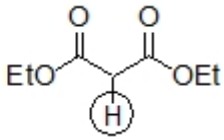
3. Which sequence ranks the following compounds in order of increasing boiling point? (3 points)

1 propionic acid **2** N-methylacetamide **3** butyronitrile

a) 1<2<3 b) 2<3<1 c) 3<1<2 d) 3<2<1 e) 2<1<3 f) 1<3<2

4. State the pKa values of the following acids within +/- 2 units. (4 points)

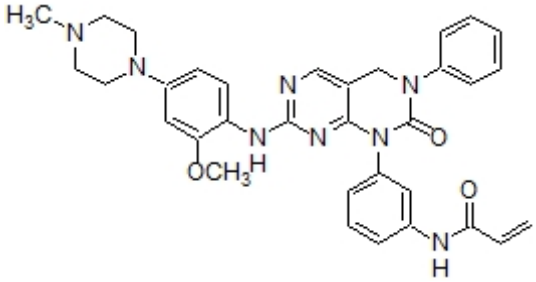




5. Circle all of the following compounds that would give a positive iodoform test. (3 points)

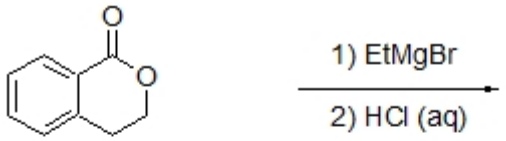
a) propanal b) ethyl acetate c) acetophenone d) pentan-3-one

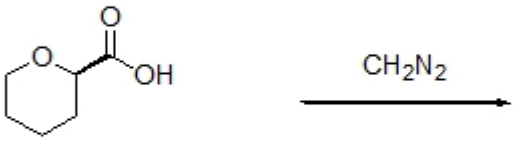
6. The following compound has been found effective in treating lung cancer (*J. Med. Chem.* **2012**, 2711). Circle all carbon centers that are at the same oxidation state as the carbon in carbonic acid. (3 points)

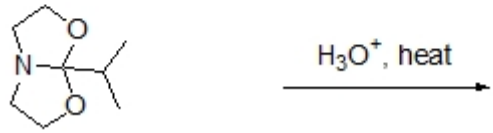


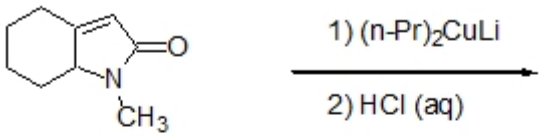
III. Reactions

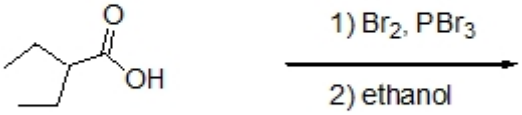
1. Predict the products of the following reactions. (19 points)

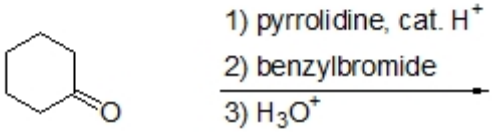




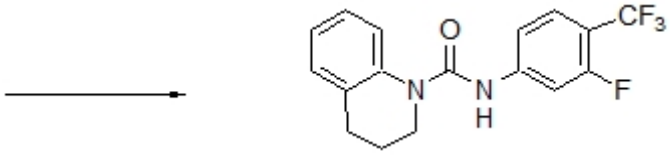




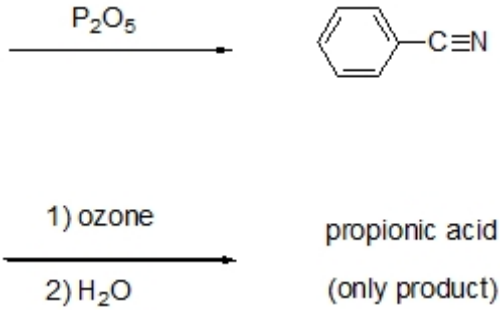




2. Show how the following compound could be made from an isocyanate starting material. (4 points)



3. Identify the necessary starting materials for the following reactions. (6 points)

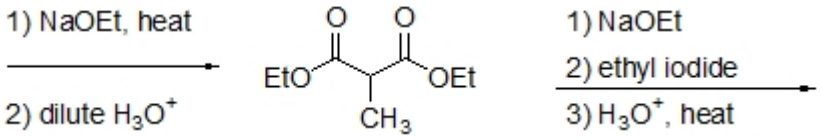


4. Circle all sequences of reactions that convert a carboxylic acid to an aldehyde. (3 points)

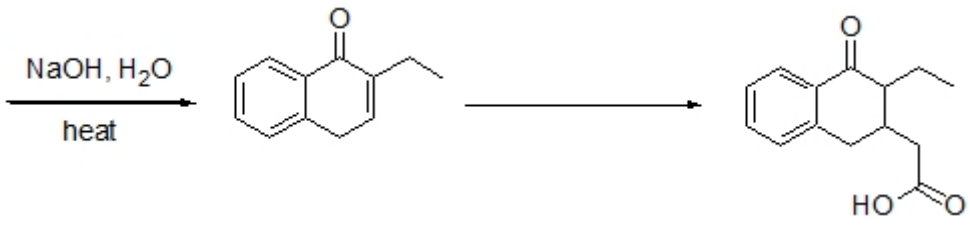
a) 1) $SOCl_2$ 2) $NaBH_4$ 3) H_3O^+
b) 1) CH_2N_2 2) DIBAL 3) H_3O^+
c) 1) $NaBH_4$ 2) H_3O^+ 3) PCC
d) 1) $SOCl_2$ 2) $LiAl(O\textit{t}\text{-}Bu)_3H$
e) 1) $LiAlH_4$ 2) $Ag(NH_3)_2OH$

5. Complete the following synthesis by filling in the missing starting material and final product. (7 points)

Claisen Condensation



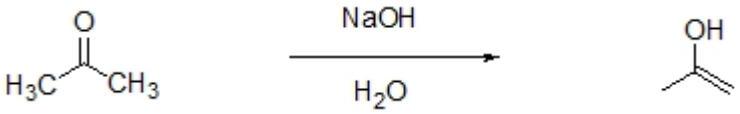
6. Complete the following sequence of reactions by filling in the missing starting material and reagents. (7 points)



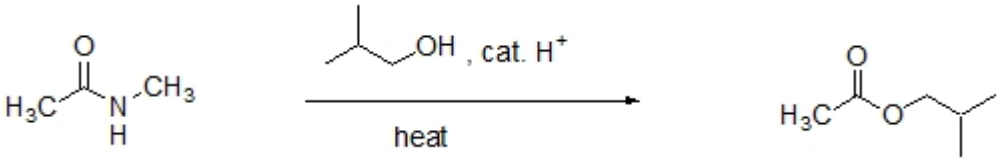
IV. Mechanisms

1. Provide an electron arrow pushing mechanism for each of the following reactions. Show all intermediates and formal charges.

(4 points)

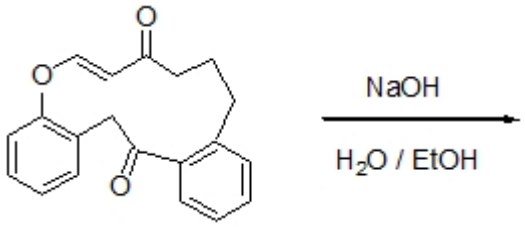


(12 points)



V. Extra Credit (5 points possible)

1. Predict the major product of the following reaction.



You received _____ points out of 100 points possible. To check your overall performance in lecture see http://canvas.weber.edu .