Organic II
Assignment # 8
Spring 2021

Name:_____

1) Give the IUPAC names for the following molecules AND draw them OR if already given the drawing, give the IUPAC name.

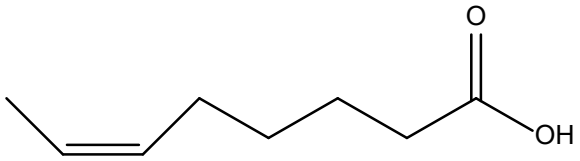
a) Methacrylic acid

b) Crotonic acid

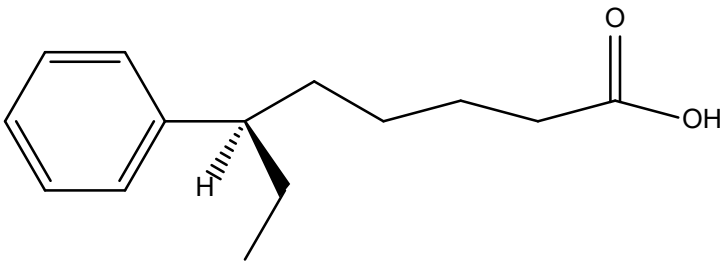
c) Oxalic Acid

d) p-Toluic acid

e)

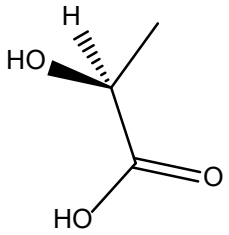


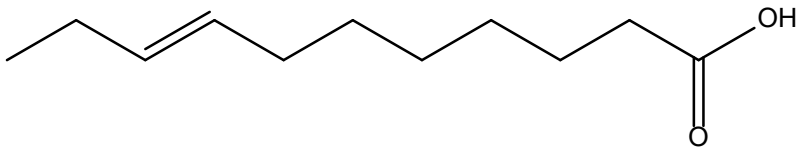
f)



g) Palmitic acid

h) Naphthenic acid (one is fine)

i) 

j) 

k) What type of acid is the acid in part j using the omega nomenclature?

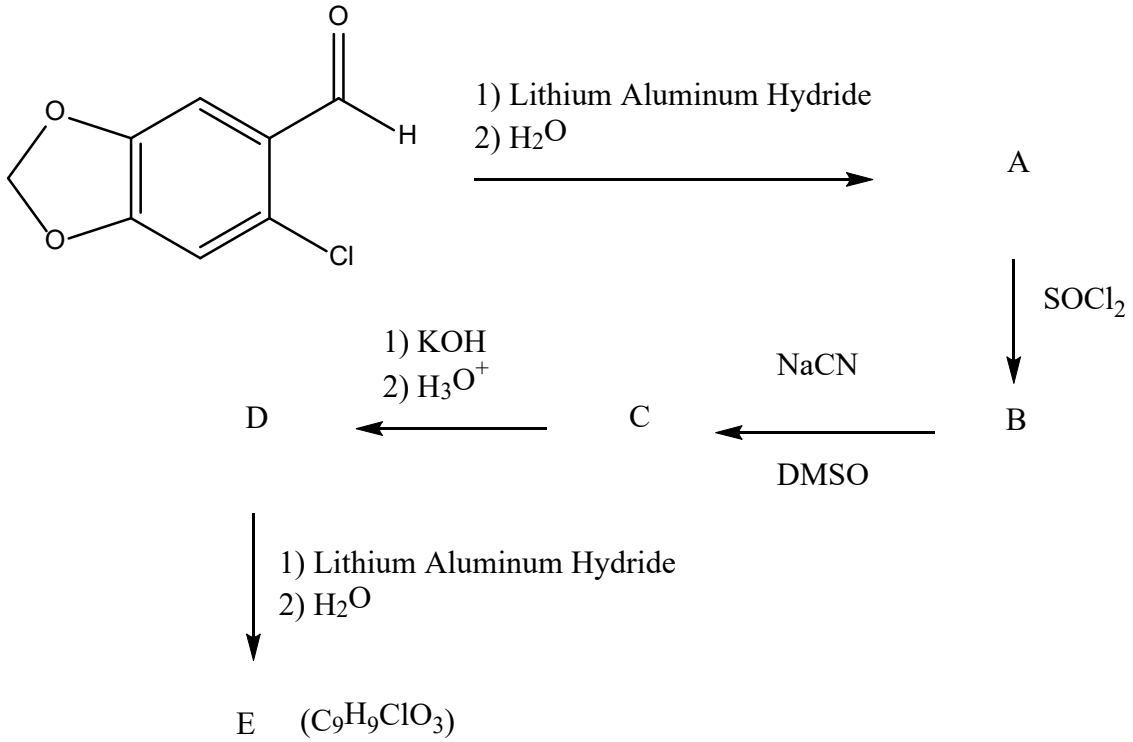
2) a) Lactic acid has a pKa of 3.9. What is the [lactate]/[lactic acid] ratio at the pH of blood (7.4)? Show your work.

b) A 0.1 M solution of lactic acid in water has a pH of 2.5. What is the [lactate]/[lactic acid] ratio in this solution? Show your work.

3) The value cited for K_1 of carbonic acid, 4.3×10^{-7}, is determined by measuring the pH of water to which a known amount of carbon dioxide has been added. When we recall that only 0.3 % of carbon dioxide is converted to carbonic acid, what is the "true K_1" of carbonic acid? Show your work.

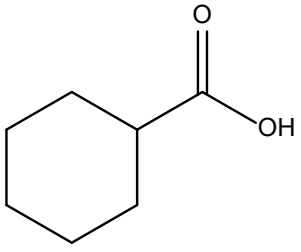
4) When benzoic acid is allowed to stand in water enriched in ^{18}O, the isotopic label becomes incorporated into the benzoic acid. The reaction is catalyzed by acids. Suggest an explanation (DRAW ARROWS) for this observation.

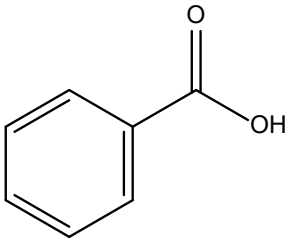
5) The compound shown was subjected to the following series of reactions. Give the product of each reaction.



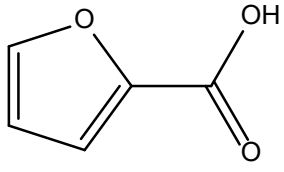
6) Circle the more acidic compound in each of the following pairs. Explain your choice.

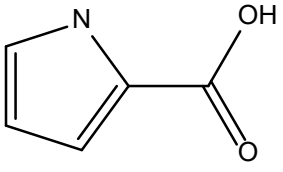
a)



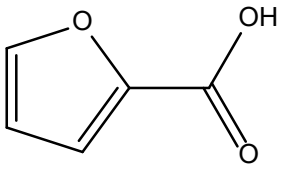


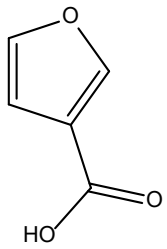
b)



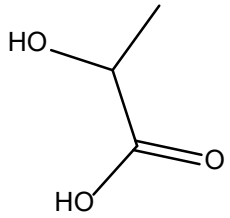


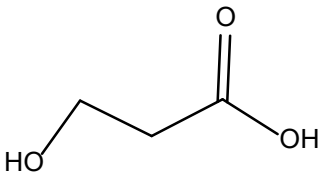
c)





d)



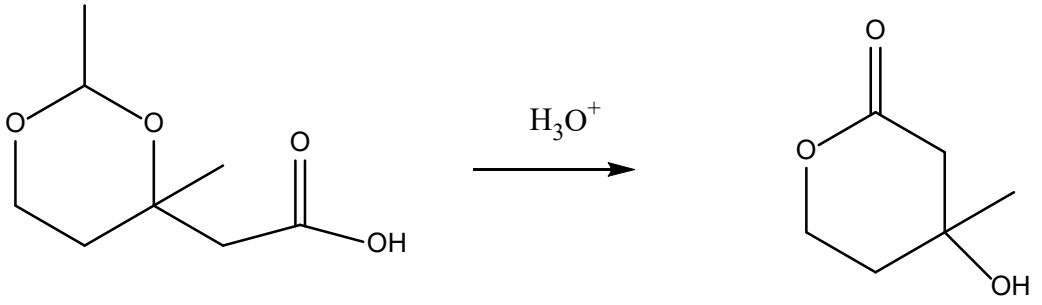


7) a) Which stereoisomer of 4-hydroxycyclohexanecarboxylic acid (cis or trans) can form a lactone? Show this lactone.

b) What is the conformation of the cyclohexane ring in the starting hydroxy acid? Show this conformation.

c) What is the conformation of the cyclohexane ring in the lactone? Show this conformation.

8) a) On standing in dilute aqueous acid, compound A is smoothly converted to mevalonolactone. Suggest (that means draw arrows) a reasonable mechanism for this reaction.

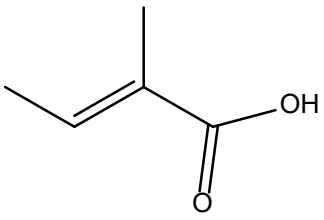


Compound A

b) What other organic product is formed in the reaction above?

9) Give the products of the following reactions.

a)



Ethanol

H_2SO_4

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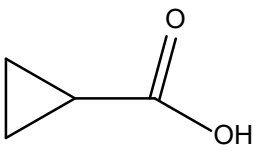
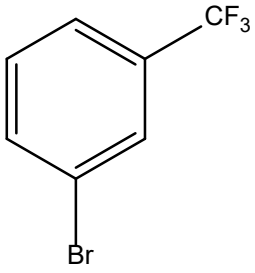
b)



1) $LiAlD_4$
2) H_2O

????

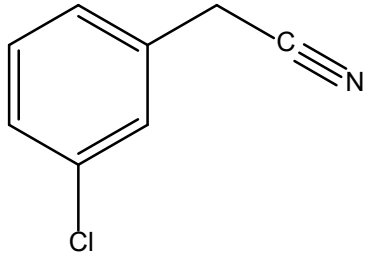
c)



1) Mg, diethyl ether
2) CO_2
3) H_3O^+

????

d)



H_2O, acetic acid

H_2SO_4, heat

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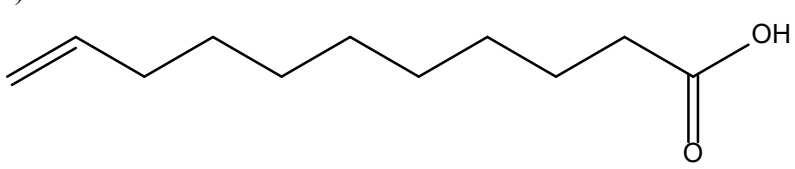
e)



HBr

Benzoyl peroxide

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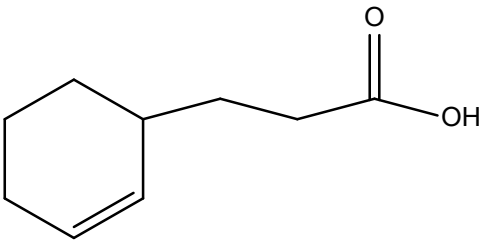
f)



I_2, KI

$NaHCO_3$, H_2O

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10) Compounds A and B are isomers having the molecular formula $C_4H_8O_3$. Identify A and B on the basis of their ^1H NMR spectra.

Compound A: δ 1.3 (3H, triplet), 3.6 (2H, quartet), 4.1 (2H, singlet), 11.1 (1H, broad singlet)

Compound B: δ 2.6 (2H, triplet), 3.4 (3H, singlet), 3.7 (2H, triplet), 11.3 (1H, broad singlet)