

Chemistry 220b, Section 1
Exam 2 (100 pts)
Thursday, March 1, 2012
Chapters 13, 15-19

Name _____

Write and sign the VU Honor Pledge:

I pledge my honor that I have neither given nor received aid on this examination

I. M. Honest

signature

This exam is closed book and closed notes

NOTE: It is difficult for me to give you partial credit if you do not show your work!

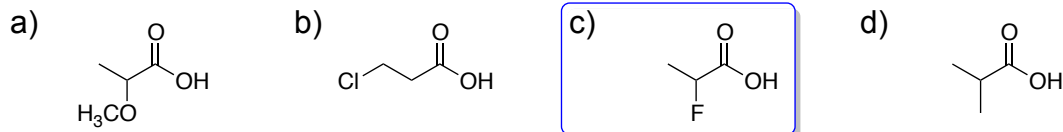
Neatness counts

Stereochemistry counts are indicated

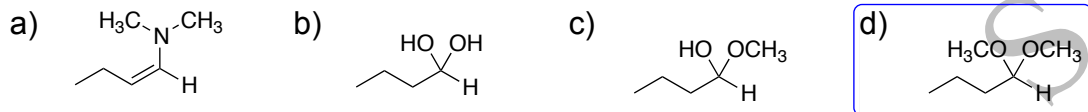
Good Luck !!

1-10. Multiple Choice. Choose the best answers for the following questions. (40 pts)

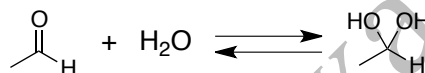
1. Which of the following carboxylic acids is predicted to have the lowest pK_a value?



2. Which of the following is an acetal?

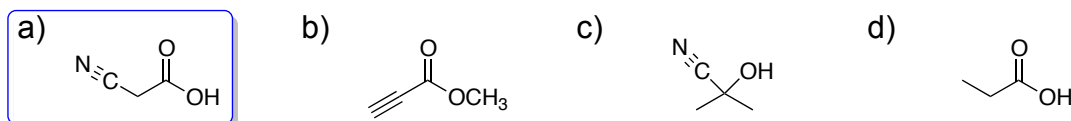
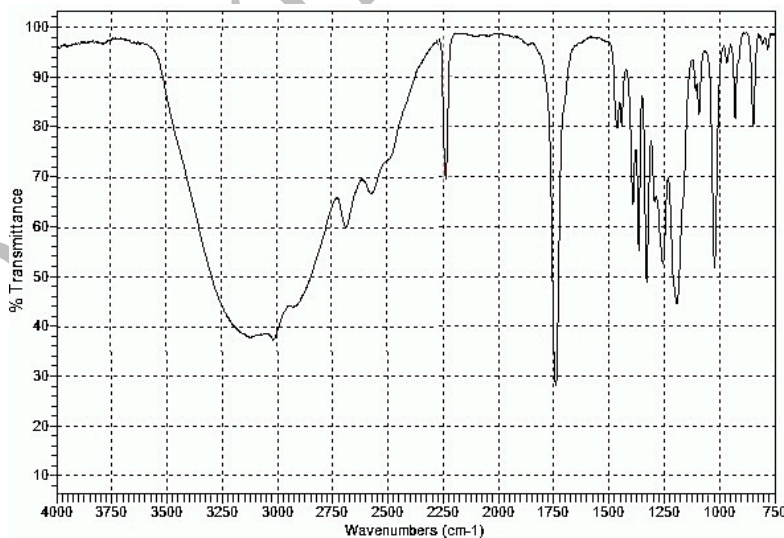


3. The equilibrium constant (K_{eq}) between acetaldehyde (ethanal) and its hydrate (1,1-dihydroxyethane) is 1 in aqueous solution. Which of the following is true, if an acid catalyst is added.

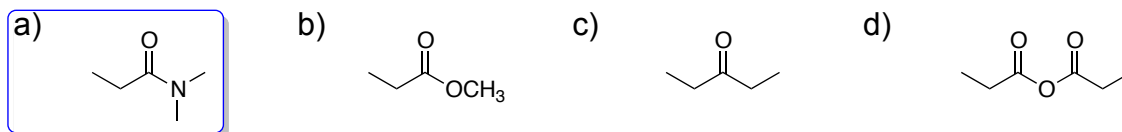


- a) $K_{eq} > 1$ c) $K_{eq} = 1$
 b) $K_{eq} < 1$ d) there is insufficient information to draw a conclusion

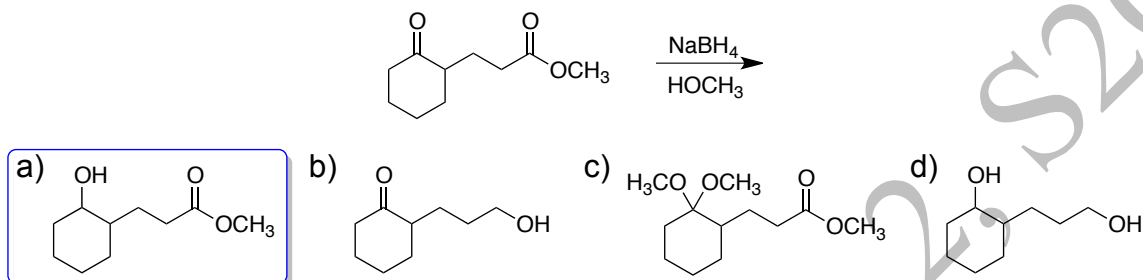
4. Which structure is most consistent with the following infrared spectrum?



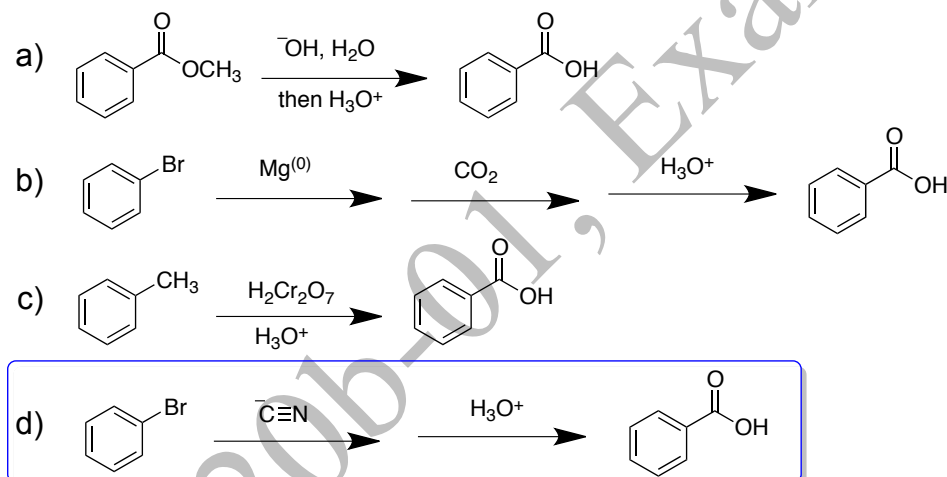
5. Which structure is most consistent with a carbonyl stretch at 1690 cm^{-1} in the infrared spectrum?



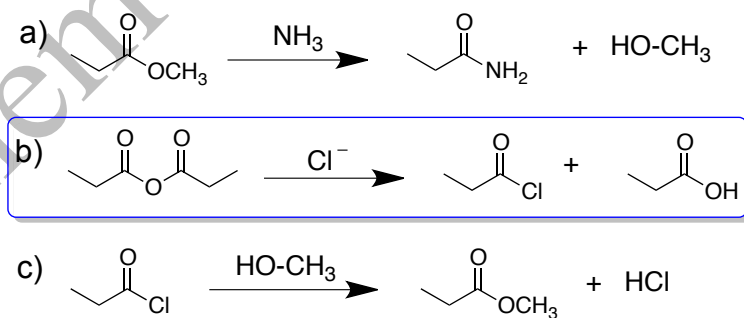
6. Which is the product of the following reaction?



7. Which of the following is not a feasible method to synthesize benzoic acid?

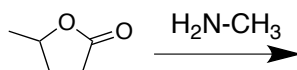


8. Which of the following reactions will not proceed as written?



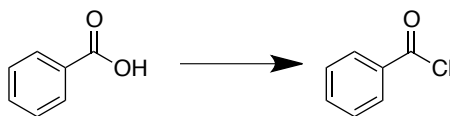
- d) none of the above, i.e., **a**, **b**, and **c** are all feasible reactions

9. Which is the product of the following reaction?



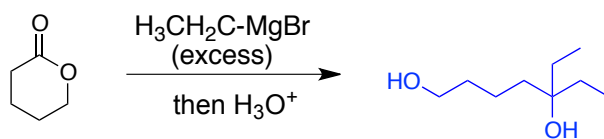
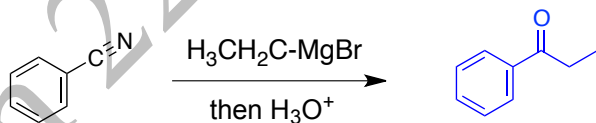
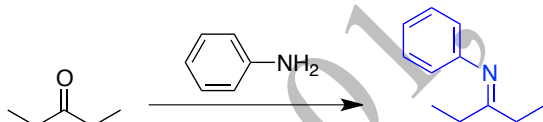
- a) b) c) d)

10. Which is the best reagent for the conversion of benzoic acid to benzoyl chloride?

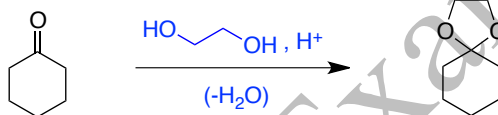
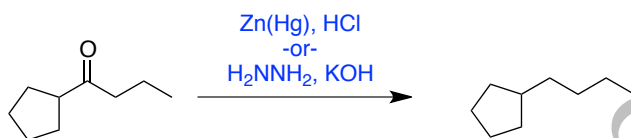
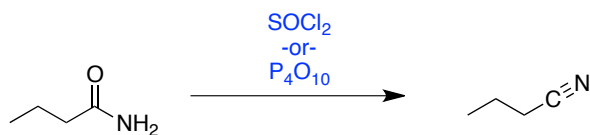


- a) $\text{Cl}_2, h\nu$ b) SOCl_2 c) AlCl_3 d) $\text{Py}^+ \text{H}^-$, CrO_3^- , CH_2Cl_2

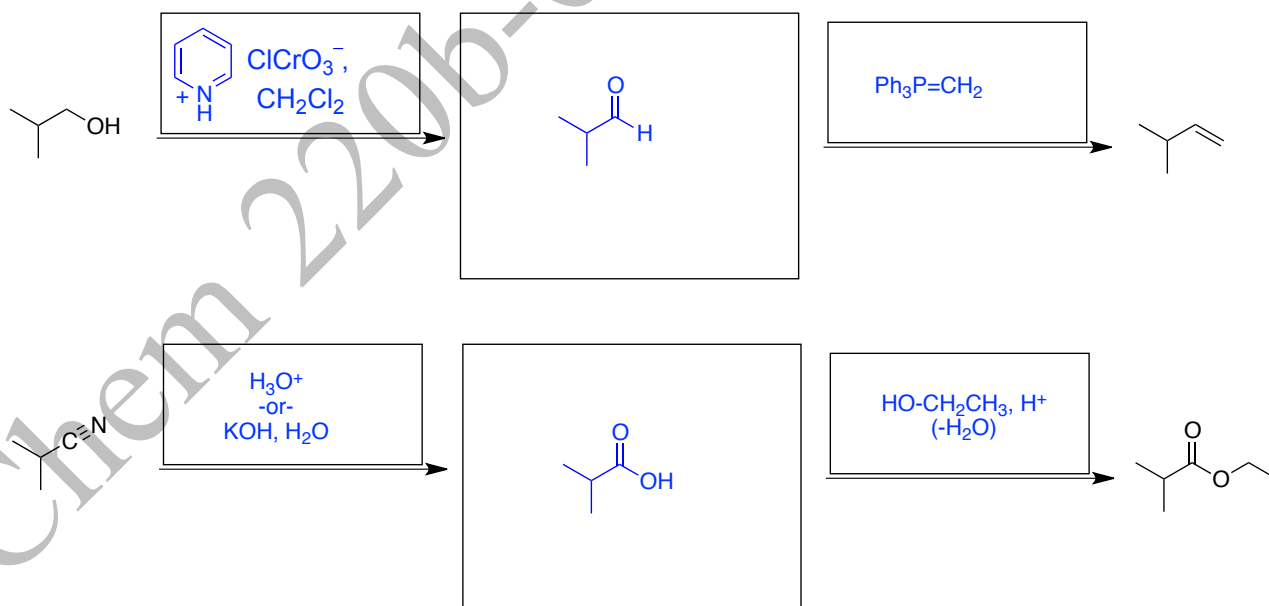
11. Give the major product for each of the following reactions. (9 pts)



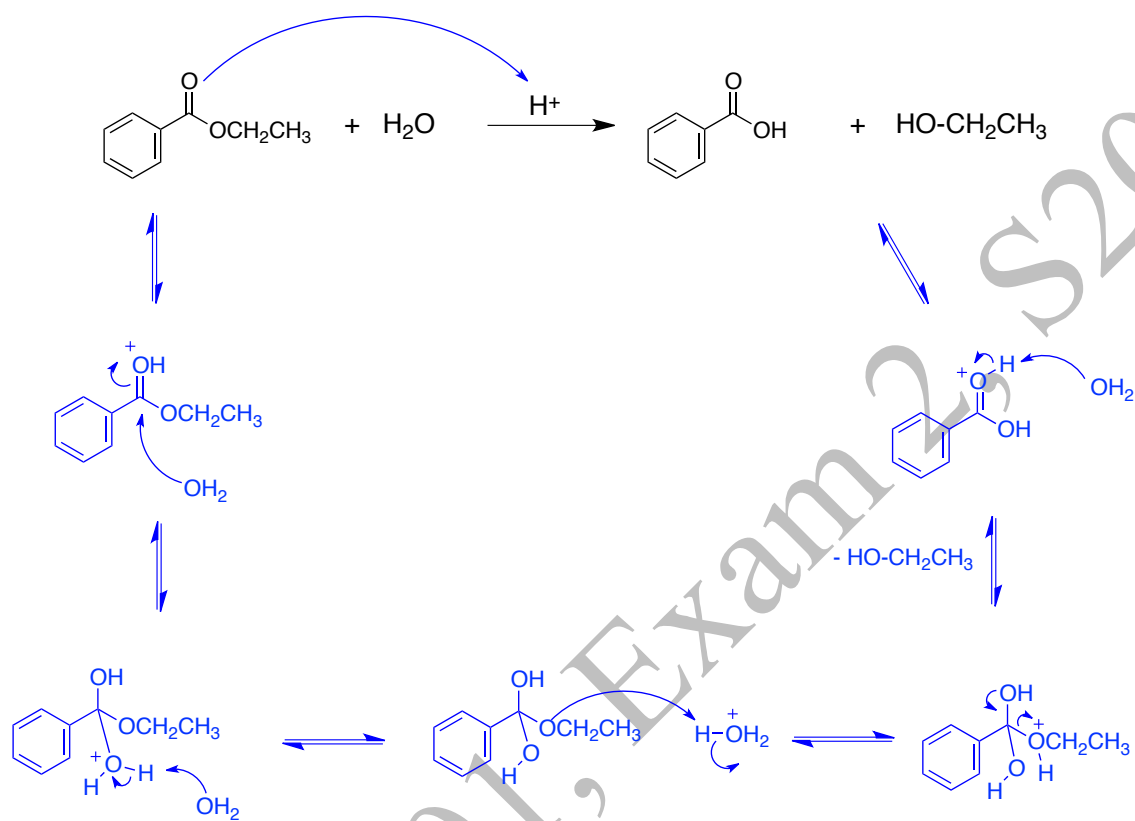
12. Provide the necessary reagent(s) for the following reactions. (9 pts)



13. The following transformations cannot be done in a single step. Complete the following by providing the correct reagent(s) and the structure of the intermediate. (18 pts)



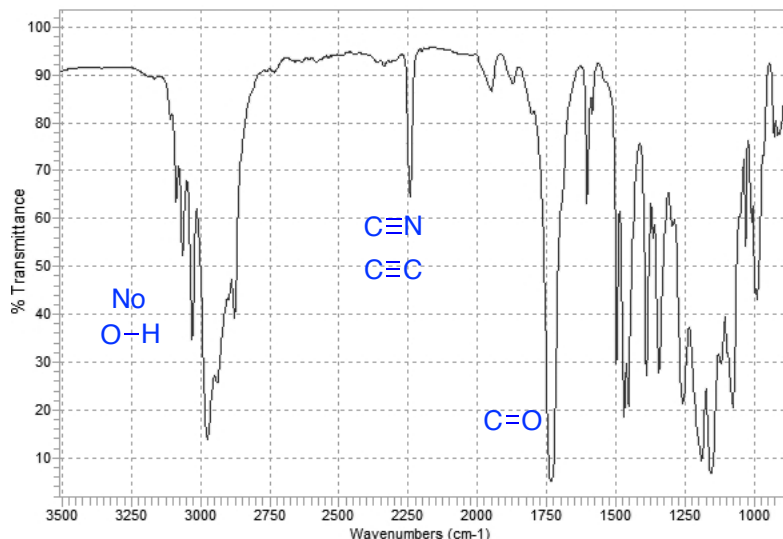
14. Give a complete, stepwise mechanism for the acid-catalyzed hydrolysis of ethyl benzoate to benzoic acid and ethanol. (12 pts)



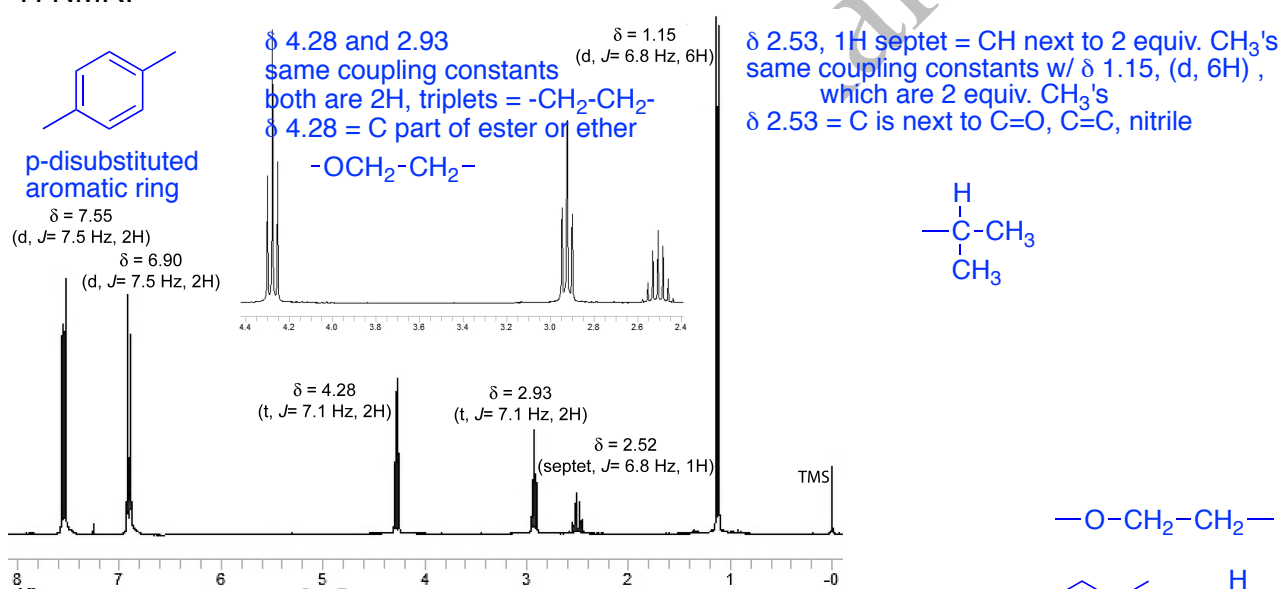
15. A molecule of formula $C_{13}H_{15}NO_2$ has the following IR, 1H and ^{13}C NMR data. Provide a structure that is consistent with the data. Please circle your final answer. (12 pts)

IR:

7 degrees of unsaturation



1H NMR:



^{13}C NMR:

δ (ppm) = 177.0 **$C=O$ – ester, amide, or acid (no OH in IR),
not ketone or aldehyde**

143.5

131.8

129.0

119.0

115.8

64.7

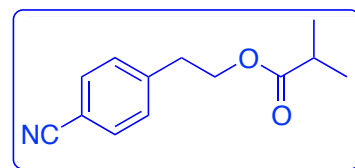
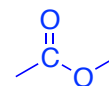
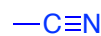
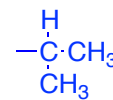
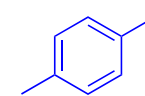
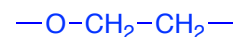
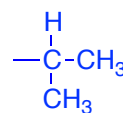
no acetylenes ^{13}C

35.2

40.0

64.0

18.9



Chem 220b-01, Exam 2, S2012

Problem 1-10: _____ (40 pts)

11: _____ (9 pts)

12: _____ (9 pts)

13: _____ (18 pts)

14: _____ (12 pts)

15: _____ (12 pts)

Total out of 100: _____