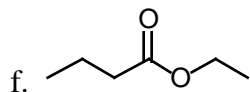
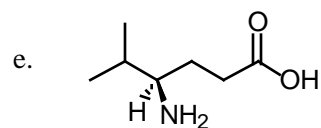
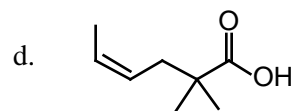


1. Nomenclature. Provide Either the Name or the Structure for the Following Chemicals. (10 points)

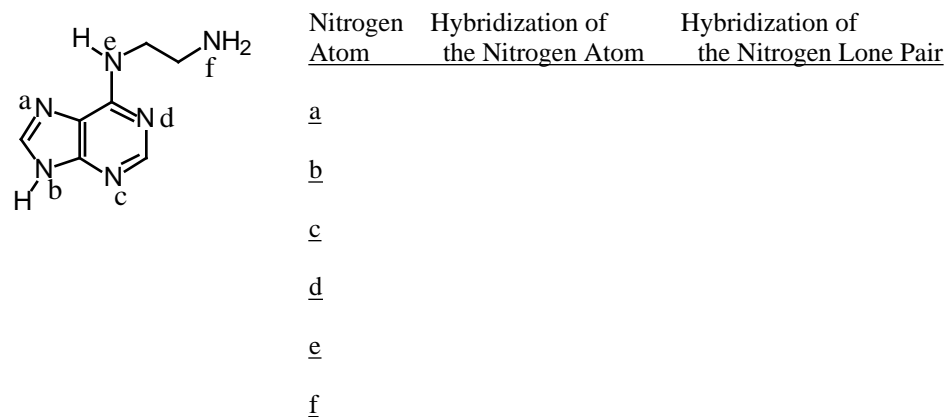
a. N-ethyl-N-methyl-4-methyl-1-pentanamine

b. sodium (R)-3-hydroxybutanoate

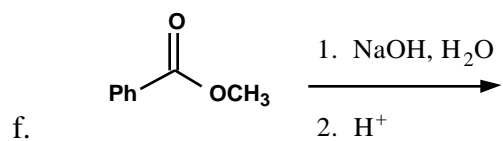
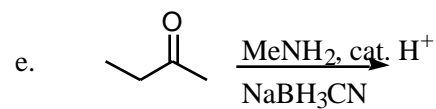
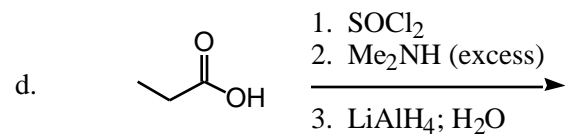
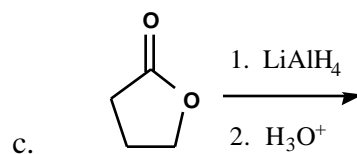
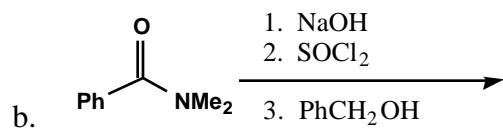
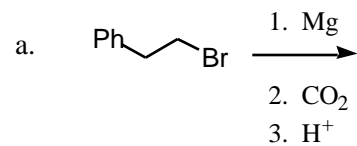
c. 4-methylpentanoyl chloride



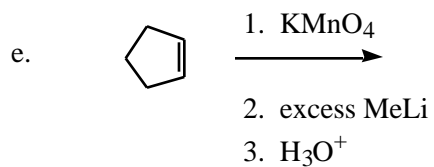
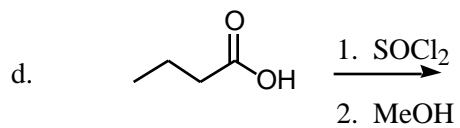
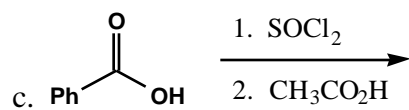
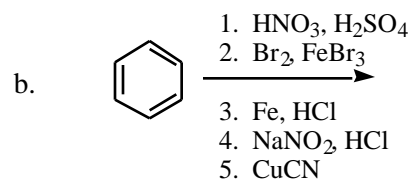
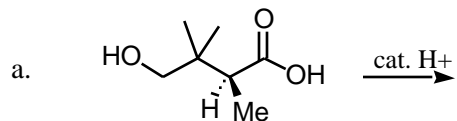
2. For each nitrogen a-f, identify the hybridization of the nitrogen atom, and identify the hybridization of the nitrogen lone pair. [Adenine is an important player in information transfer (DNA, RNA, genetics, etc.) and energy storage/release (ATP/ADP).]



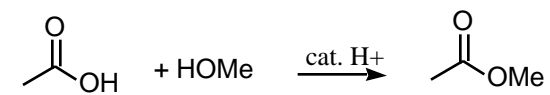
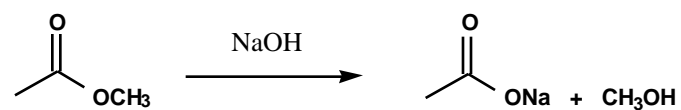
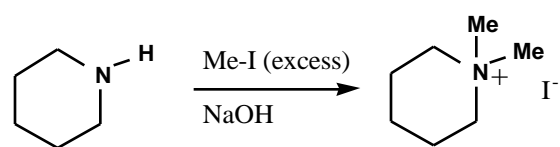
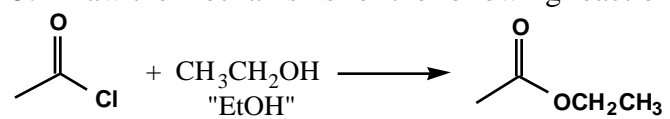
3. Synthesis Reactions. Draw the feature product of the following reactions (need not show any byproducts). (15 points)



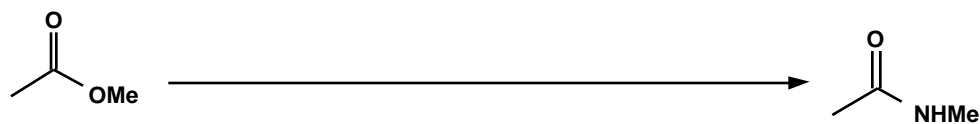
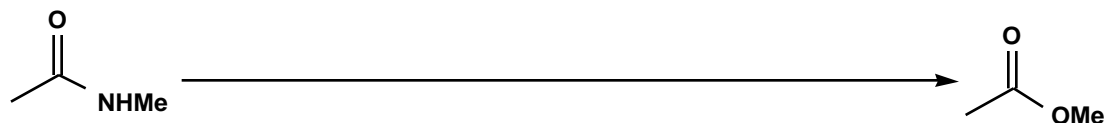
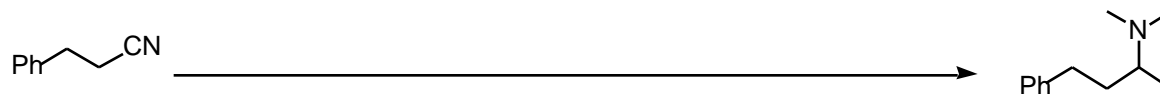
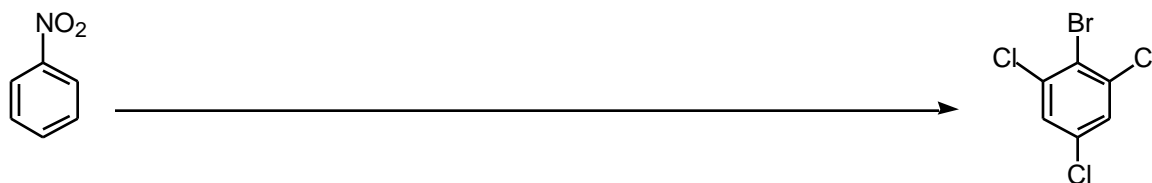
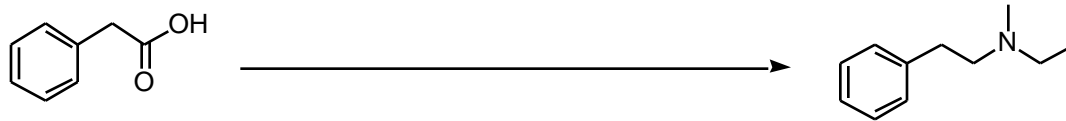
4. Synthesis Reactions. Draw the feature product of the following reactions (need not show any byproducts). (15 points)



5. Draw the mechanisms for the following reactions. (5 points)



6. Provide Reagents for the following Transformations (15 points)

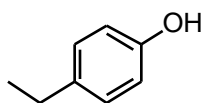


7. Which, when dissolved in diethyl ether, will: (5 points each)

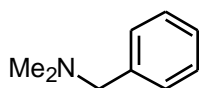
a) Extract into NaOH/H<sub>2</sub>O?

b) Extract into HCl/H<sub>2</sub>O?

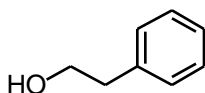
c) Extract into water?



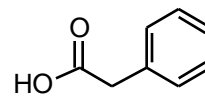
**A**



**B**

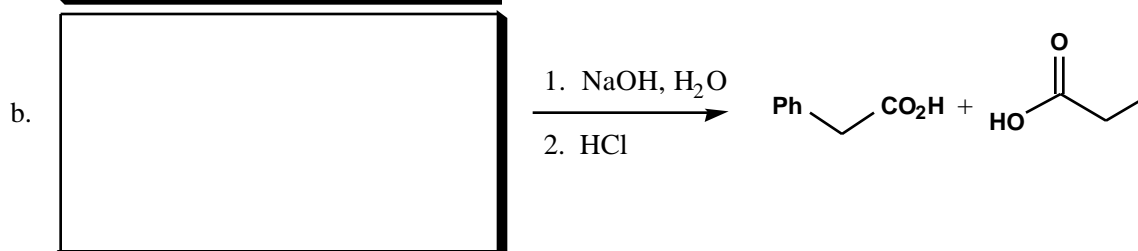
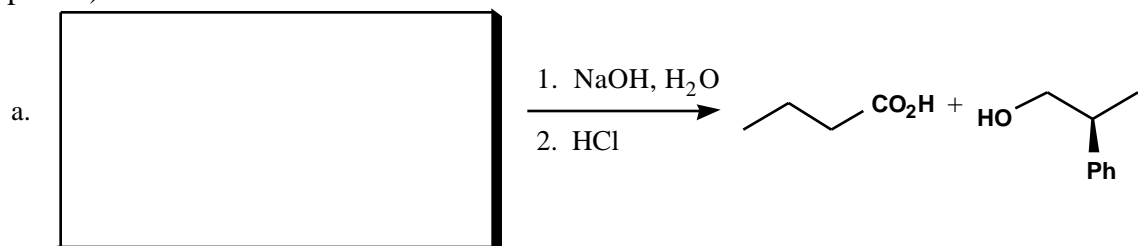


**C**

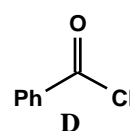
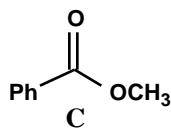
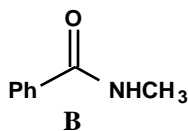
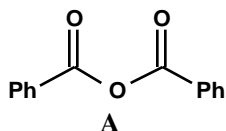


**D**

8. Hydrolysis Reactions. Draw the starting materials for the following hydrolysis reactions. (6 points)



9. Rank the following according to their reactivity toward NaOH/H<sub>2</sub>O hydrolysis.



Given the structures **A-D** above, which of the following reactions will proceed spontaneously? (2 points)



10. Rank the acidity of the following, 1 being most acidic, 3 being least (3 points each)

a. acetic acid vs. water vs.  $\text{NH}_4^+\text{Cl}^-$

b.  $\text{CH}_3\text{OH}$  vs.  $\text{CH}_3\text{NH}_2$  vs.  $\text{F}_2\text{CHOH}$

c. p-methoxybenzoic acid vs. benzoic acid vs. acetone

11. Rank the basicity of the following, 1 being most basic, 3 being least (3 points each)

a.  $\text{CH}_3\text{OH}$  vs.  $\text{PhNH}_2$  vs.  $\text{CH}_3\text{NH}_2$

