

ANSWER KEY

COLUMBIA UNIVERSITY

Chemistry S3444 Org Chem II Prof. I.J. Borowitz

Summer 1992 Exam. No. 2: Tu July 28, 1992

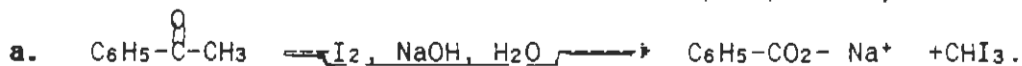
NAME: POLLY ESTER & AL DOLE

Please use a non-red pen. Answer questions in the provided space. If you write any answers on the back of the page, indicate this on the front of that page. **Good Luck!**

Note: Points appear in parentheses and margin.

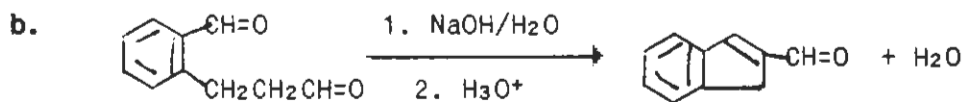
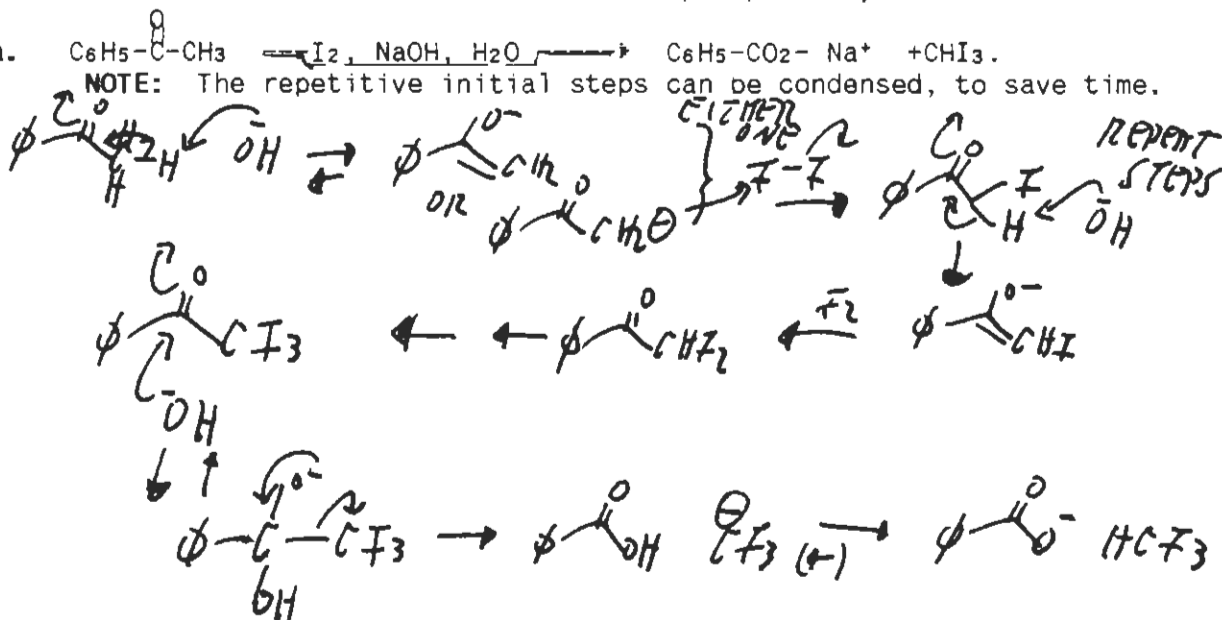
Question	max. pts.	points
1. 6 + 5 + 5	= 16	
2. 6 x 3	= 18	
3. 3+3+5+6	= 17	
4. 5 + 10	= 15	
5. 3+3+4+8+2	= 20	
6. 2+2+2 +8	= 14	
TOTAL	100	

1. (16) Give the detailed mechanisms for the following reactions. Use arrows to show electron flow. Show each step separately.

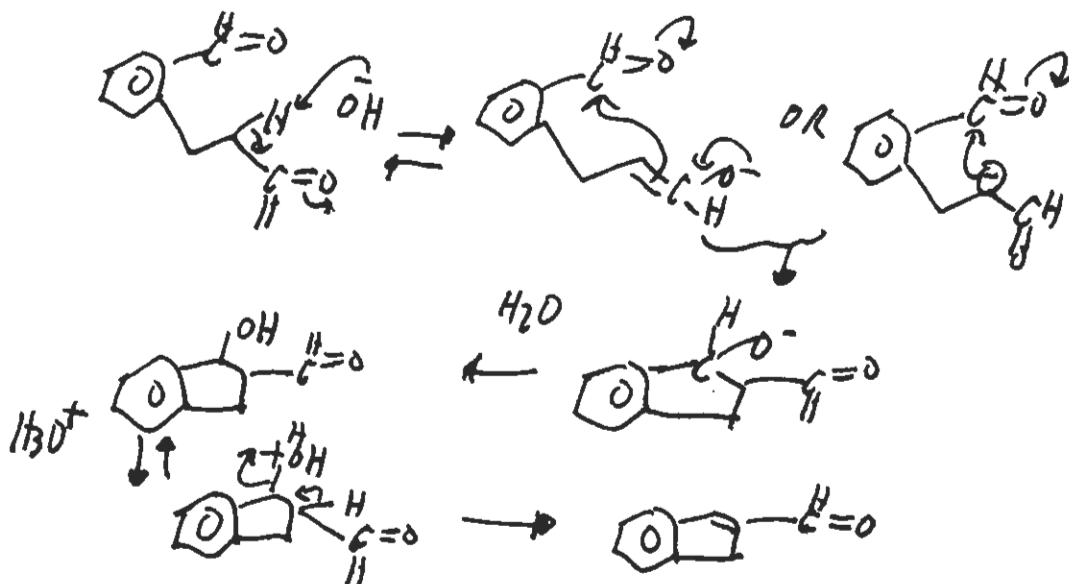


NOTE: The repetitive initial steps can be condensed, to save time.

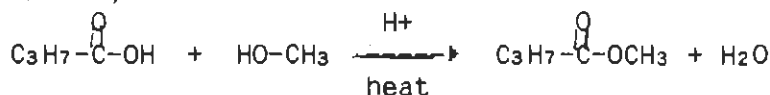
6pt



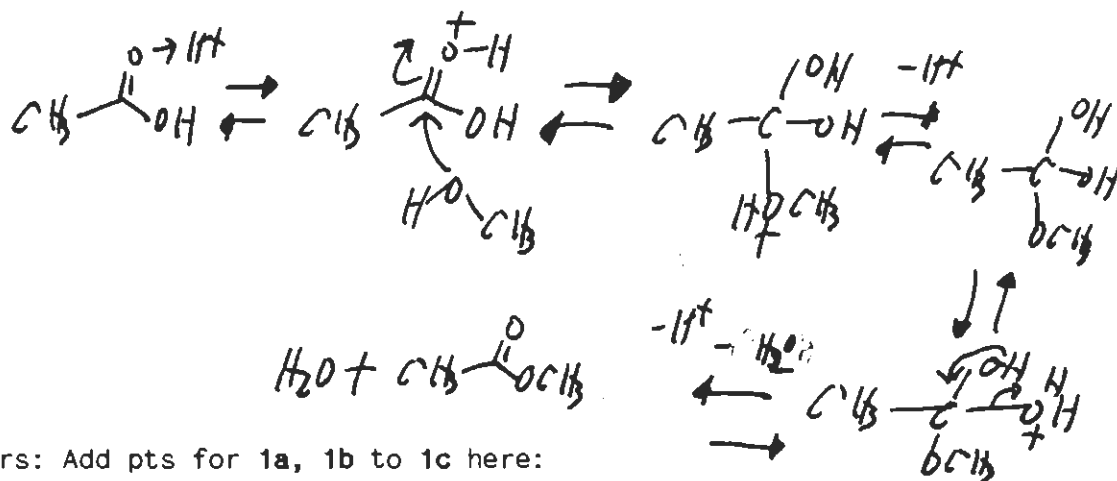
5pt



1c. Mechanisms, cont'd



5pt

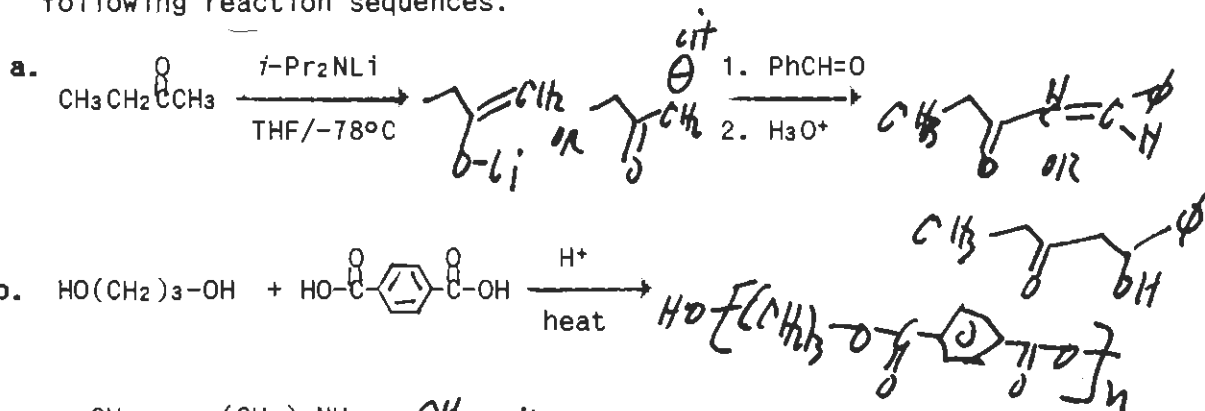


Graders: Add pts for 1a, 1b to 1c here:

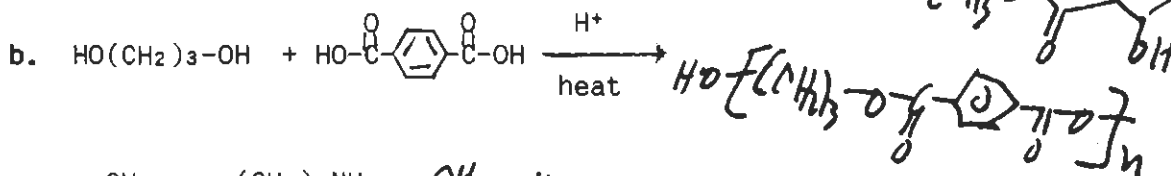
(18)

2. Fill in the missing reagents or major organic products for each of the following reaction sequences.

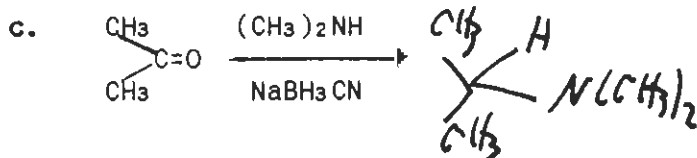
3pt



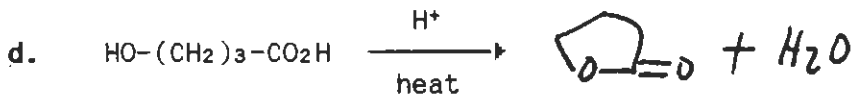
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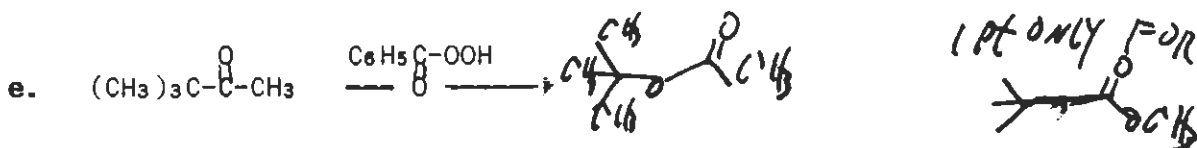
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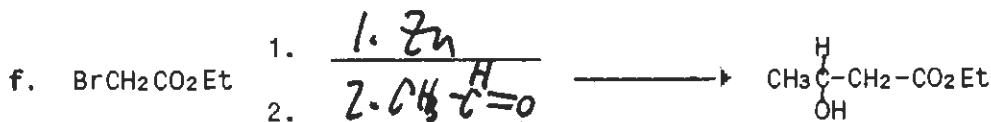
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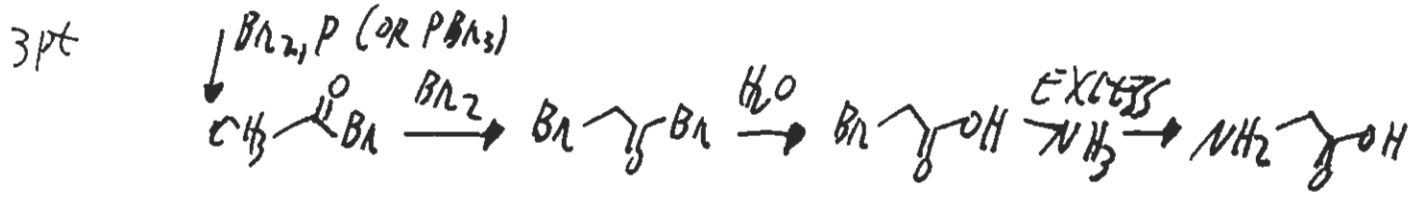
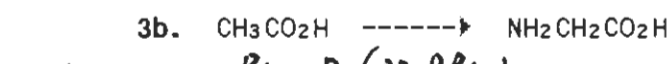
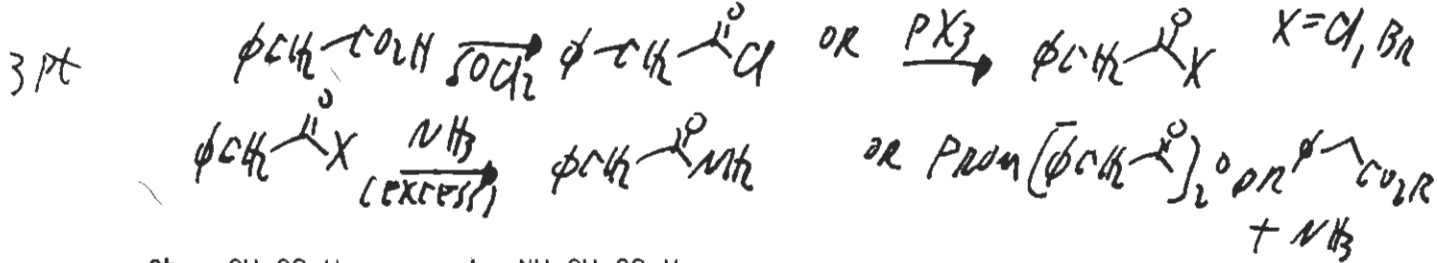
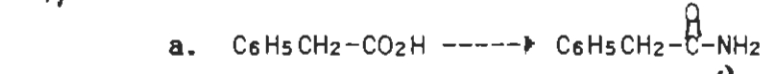
3pt



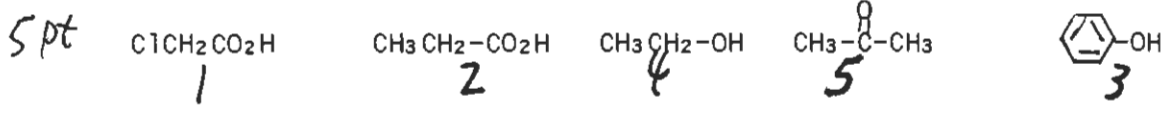
3pt



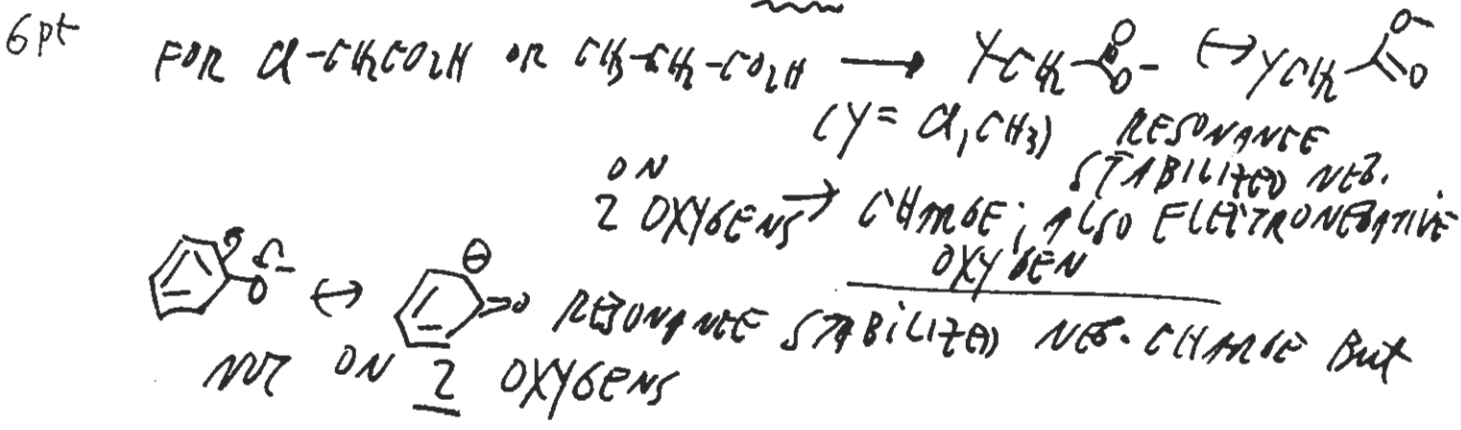
3. Do the following transformations writing the structures of all necessary organic / inorganic reagents. More than one step may be necessary.



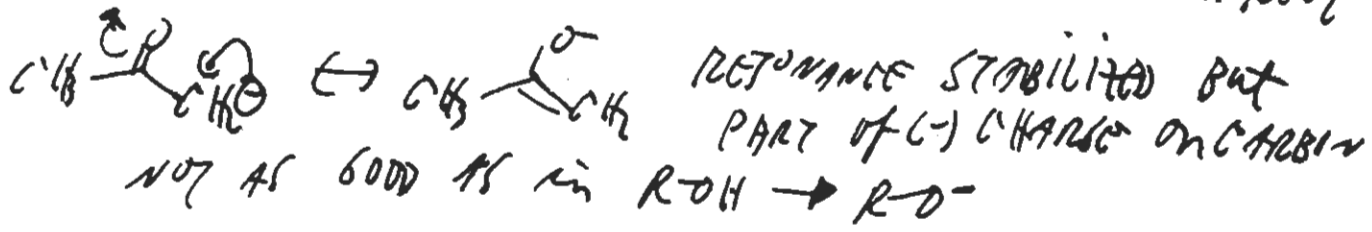
3c. Rank the following compounds: strongest (# 1) to weakest (# 5) acidity:



d. Explain your ordering with words and by writing structures including resonance and/ or inductive effects for three of the above structures:



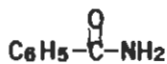
$CH_3CH_2O^-$ NEGATIVE CHARGE ON ELECTRONEGATIVE OXYGEN NOT AS GOOD AS RESONANCE STABILIZATION in RCO_2^-



4. (15) Distinguish between the members of **each** of the following pairs of compounds by the requested number of chemical tests or reactions. Write structures of all organic and inorganic products for reactions or tests and also **observations** for the tests (what would you see). Write what happens, if anything, to each compound in the pair.

(5) a.

One test or reaction

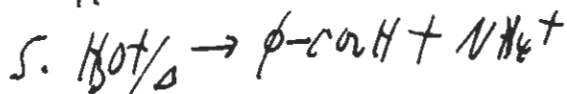


1. NOT ACID-SOLUBLE

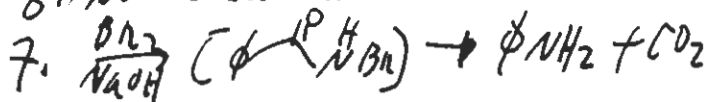
2. NO REACTION

3. " "

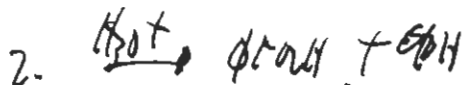
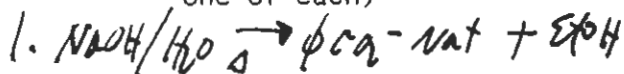
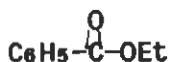
4. " "



6. NO VISIBLE RXN

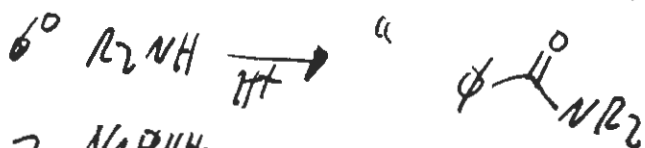
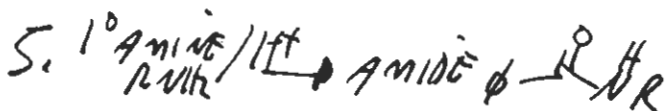


(10) b. Two tests or reactions (or one of each)

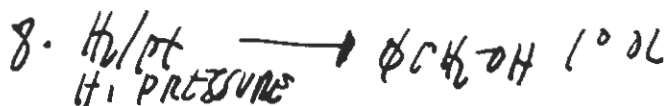


3. NO RXN WITH 2,4-DNPH

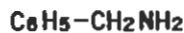
4. " " WITH $\text{NH}_2-\text{N}(\text{C}_6\text{H}_5)_2$



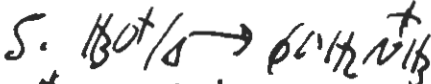
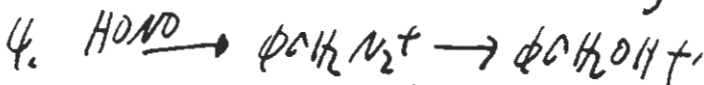
7. NaBH_4 NO RXN



9. NO $\text{C}_6\text{H}_5\text{I}_3$ RXN

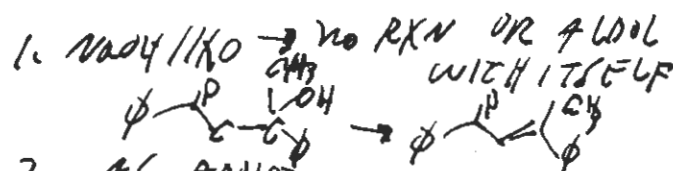


1. DISSOLVES IN DIL HCl

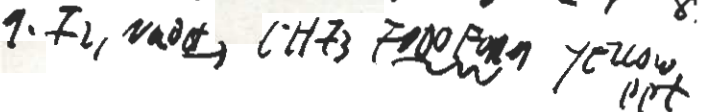
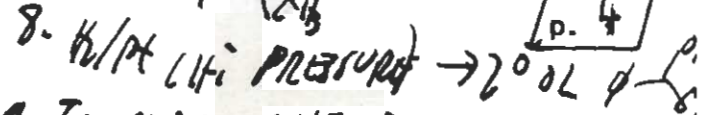
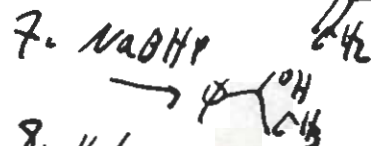
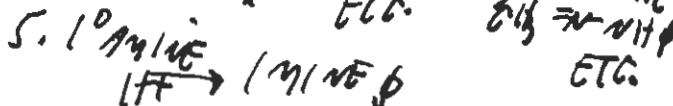
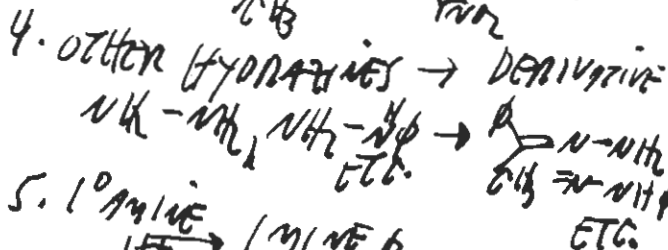
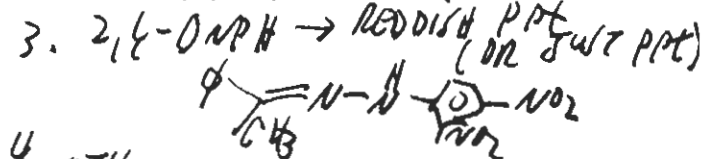


6. TEST (HINBERG): AMINE DISSOLVES IN NaOH / $\text{NaOH}/\text{H}_2\text{O}$ PPTS IN ACID

7. NO CO_2 LOSS



2. AS ABOVE



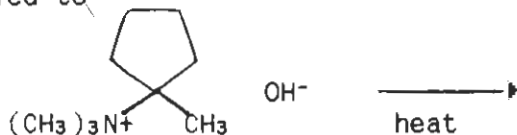
(20) 5. a. Simple enols are less stable than the tautomeric keto forms because (circle one correct answer):

3 pt

1. severe angle strain exists in the enol form
2. fewer atoms are coplanar in the keto form
3. the enol cannot be chiral
4. the C=C π bond is weaker than the C=O π bond

b. Which compound is the major product in the Hofmann elimination of applied to:

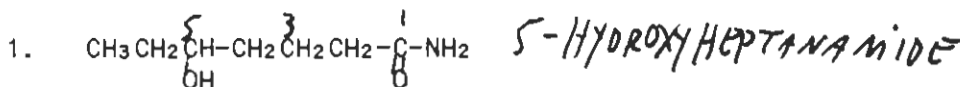
3 pt



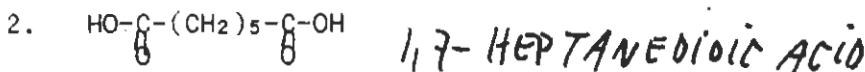
1. C=C1CCCC1 2. CC1=CCCC1 3. CC1C=CC=C1
4. CC1C=CC=C1 5. C=CC=CC=C

c. Write IUPAC names (with numbering) for the following molecules:

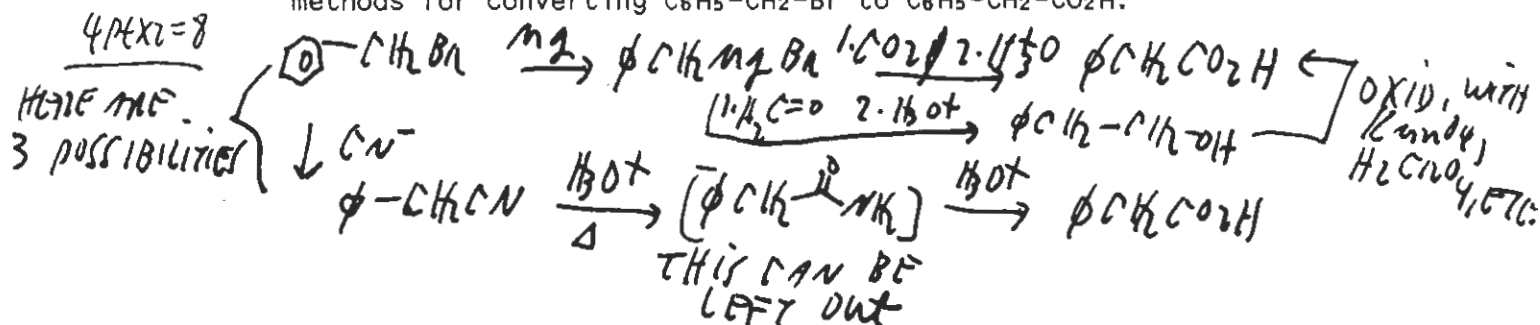
2 pt



2 pt



d. Using any necessary organic/ inorganic reagents, write TWO DIFFERENT methods for converting C6H5-CH2-Br to C6H5-CH2-CO2H.



e. Which one of the following sets of conditions can be used to carry out the conversion of CH3CH2-CO2H \longrightarrow CH3CH2-NH2 (circle correct answer):

2 pt

1. SOCl2; then NH3; then H3PO2
2. CH3Li; then NH3, H2, Ni
3. SOCl2; then NH3; then Br2, NaOH, H2O
4. PCl5; then NH3; then HCl, NaNO2
5. PCl5; then CH3NH2; then KMnO4, OH^-, H2O, heat

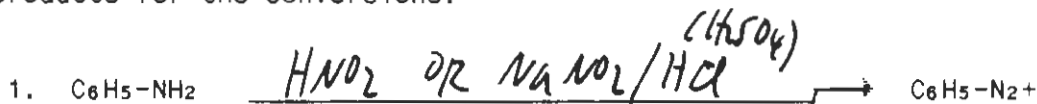
6. (14) a. When the Kolbe electrolysis procedure is applied to an aqueous solution of potassium stearate $\text{CH}_3(\text{CH}_2)_{16}\text{CO}_2^- \text{K}^+$, there is produced (circle one correct answer):

2 pt

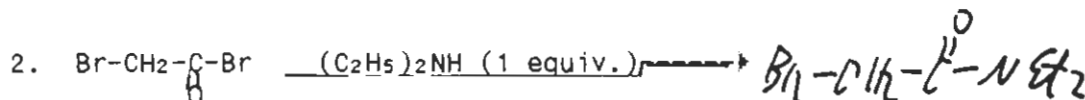
1. $\text{CH}_3(\text{CH}_2)_{14}\text{CH}_3$ ④ $\text{CH}_3(\text{CH}_2)_{32}\text{CH}_3$
 2. $\text{CH}_3(\text{CH}_2)_{15}\text{CH}_3$ 5. $\text{CH}_3(\text{CH}_2)_{34}\text{CH}_3$
 3. $\text{CH}_3(\text{CH}_2)_{18}\text{CH}_3$

b. Write the required organic/inorganic reagents or the major reaction products for the conversions:

2 pt

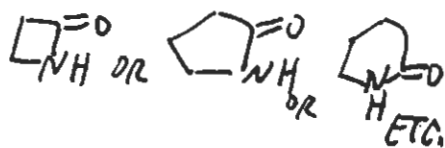


2 pt



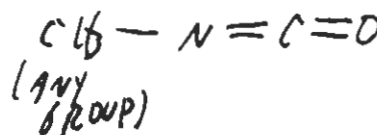
Write the structure of a real example of each of the following groups of compounds. Use real groups, not "R".

c. a lactam *ANY CYCLIC AMIDE*

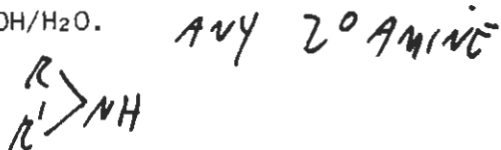


2 pt X 4 =
8 pt

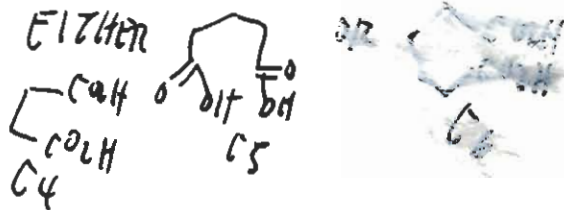
d. an isocyanate



e. an amine which gives a benzene-sulfonamide that is not soluble in $\text{NaOH}/\text{H}_2\text{O}$.



f. a dicarboxylic acid that forms a cyclic anhydride upon heating



SCRAP

SCRAP