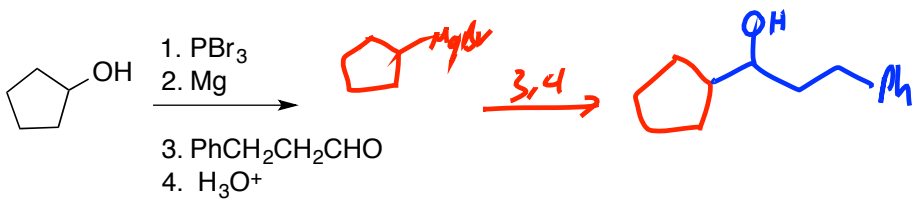
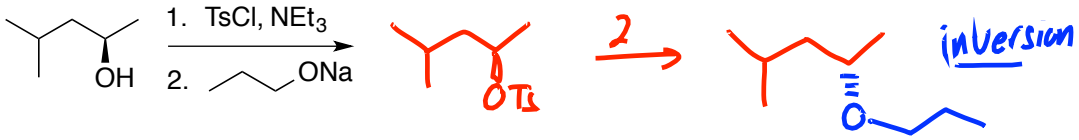
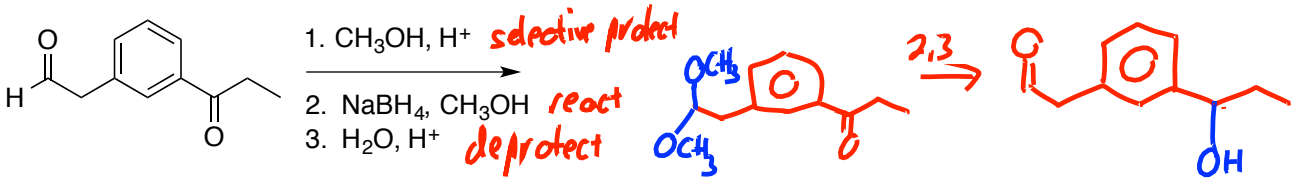
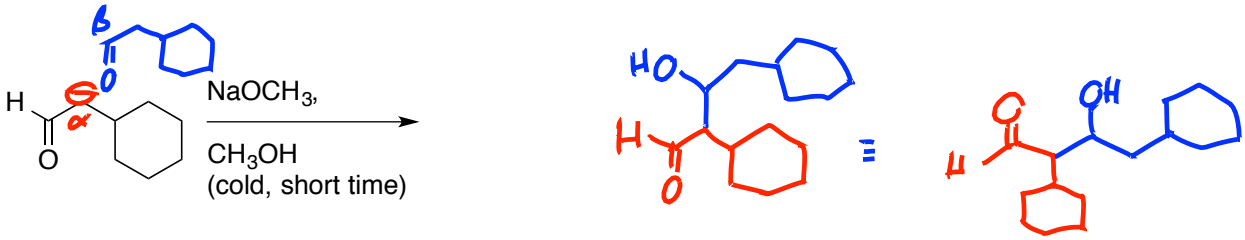
Organic Chemistry II - Jasperse FINAL EXAM PRACTICE VERSION 1

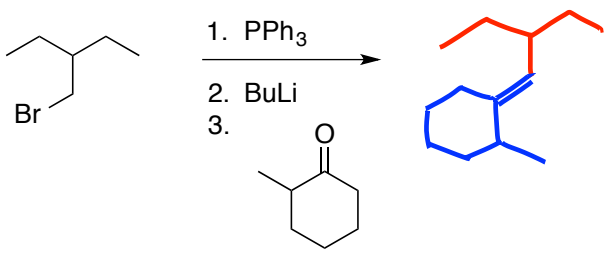
1. Give the major product for the following reactions. (3 points each)

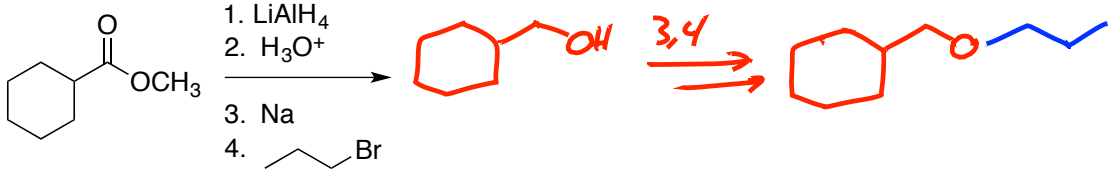
a. 

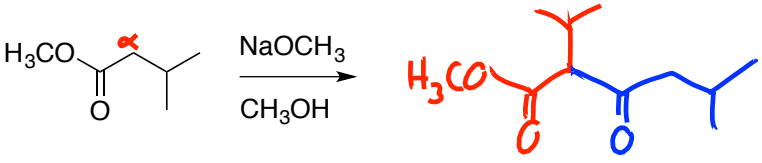
b. 

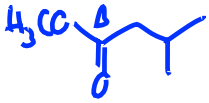
c. 

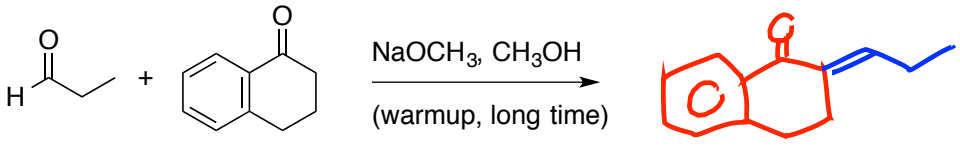
d. 

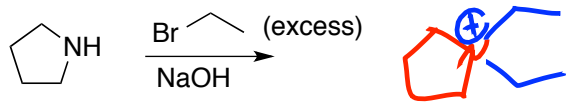
e. 

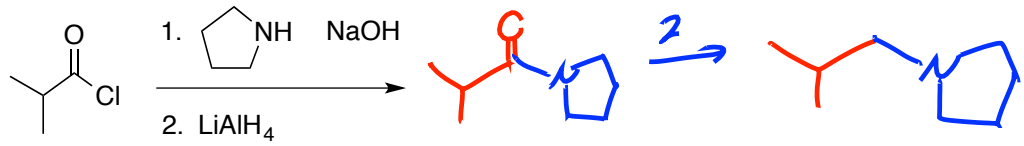
f. 

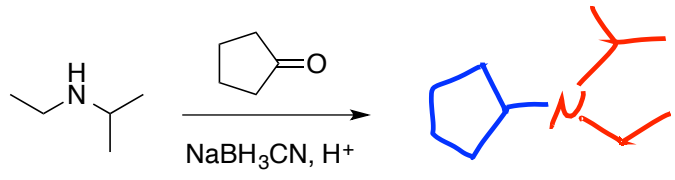
g. 



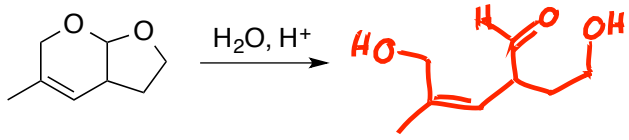
h. 
O
H
+
O
NaOCH3, CH3OH
(warmup, long time)

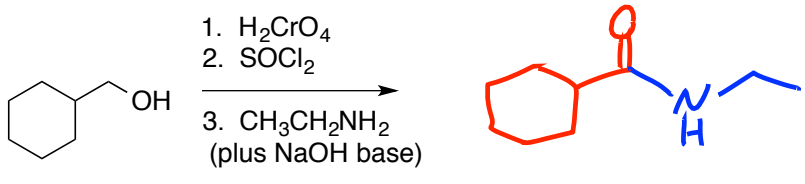
i. 
NH
Br
(excess)
NaOH

j. 
O
Cl
1.
NH
NaOH
2. LiAlH4
2

k. 
H
N
O
NaBH3CN, H+

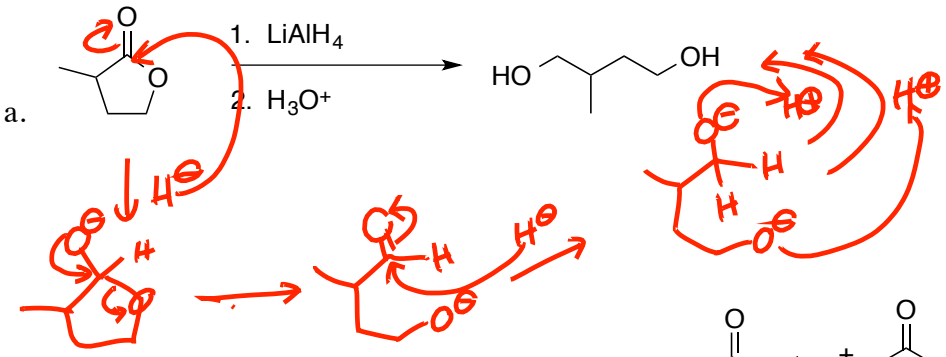
l. 
HO
1. PBr3
2. NaCN
3. H2O, H+, heat
3
HO

m. 
O
O
H2O, H+
HO
OH

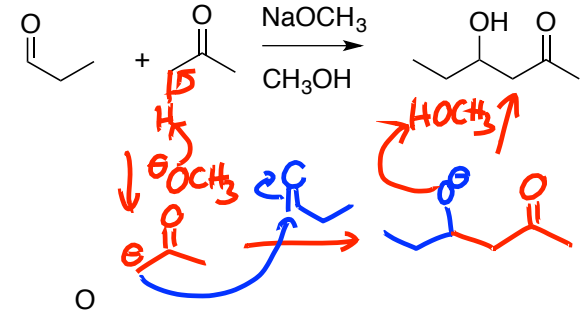
n. 
OH
1. H2CrO4
2. SOCl2
3. CH3CH2NH2
(plus NaOH base)

2. Provide the **mechanisms** for the following reactons (3 points each)

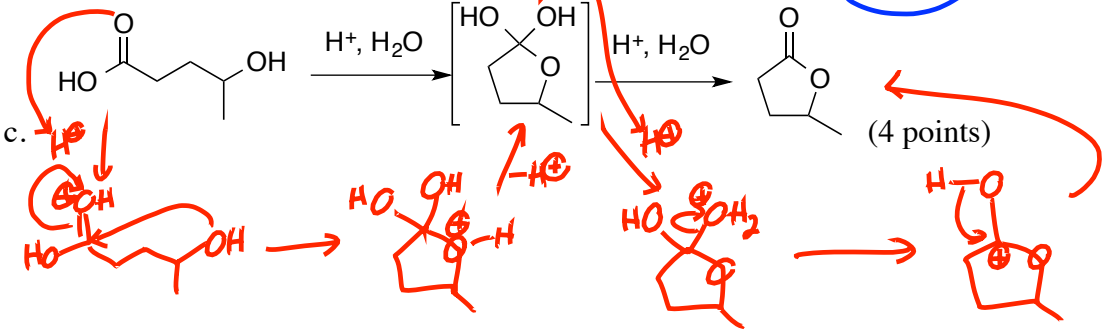
a.



b.

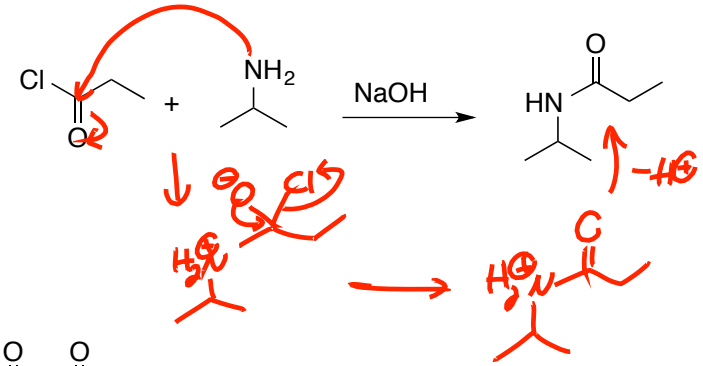


c.

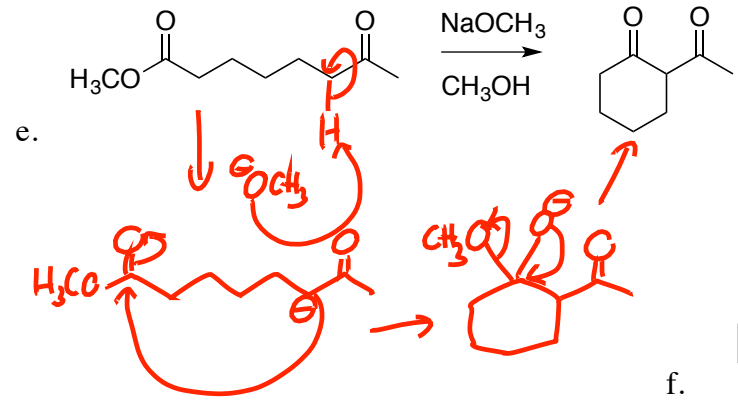


(4 points)

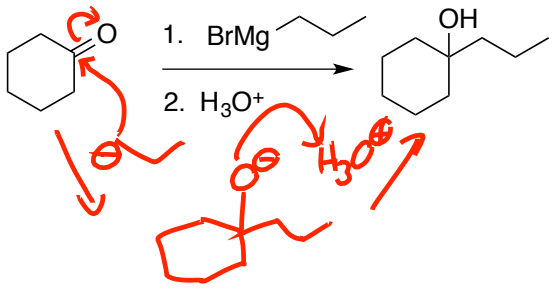
d.



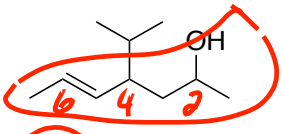
e.



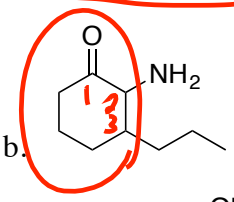
f.



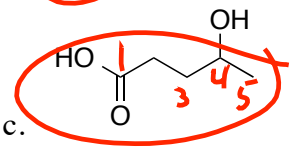
3. Give **Names or structures** for the following: (6 points)

a. 

E-4-isopropylhept-5-en-2-ol

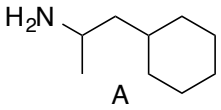
b. 

2-amino-3-propylcyclohexanone

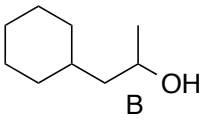
c. 

4-hydroxypentanoic acid

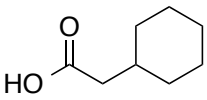
4. **Separatory Funnel/Extraction**: Suppose the following three chemicals are initially dissolved in ether in a separatory funnel. (2 points each; there will not necessarily be something extracted in each aqueous wash, so "none" might be the correct answer.).



A



B



C

a. Identify which (if any) would **extract out into the aqueous layer** if treated with **basic water (NaOH/H_2O)**.

C

b. Identify which (if any) would **extract out into the aqueous layer** if treated with **acid water (HCl/H_2O)**.

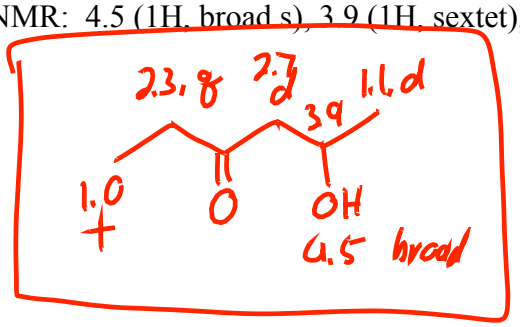
A

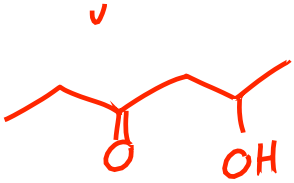
c. Identify which (if any) would **extract out into the aqueous layer** if treated with **neutral distilled water (H_2O)**.

none

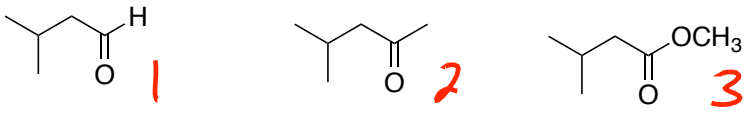
5. Mystery Problems: Suggest a structure for an unknown A whose formula is $C_6H_{12}O_2$ and gives the following chemical test results. (4 points)

- Formula $C_6H_{12}O_2$ — 1 EU
- Hydrogenation Test H_2/Pt — no alkene — No reaction
- Chromic Acid Test H_2CrO_4 — 2° alc — Reacts, turns green/brown, precipitate forms.
- Lucas Test $HCl/ZnCl_2$ — 2° alc — Reacts, makes 2nd layer.
- 2,4-DNP Test 2,4-dinitrophenylhydrazine — Reacts, yellow precipitate — ketone
- Tollens Test $Ag(NH_3)_2^+OH^-$ — No reaction — ketone
- Iodoform Test excess I_2, NaOH, H_2 — No reaction — ketone
- H-NMR: 4.5 (1H, broad s), 3.9 (1H, sextet), 2.7 (2H, d), 2.3 (2H, q), 1.1 (3H, d), 1.0 (3H, t)

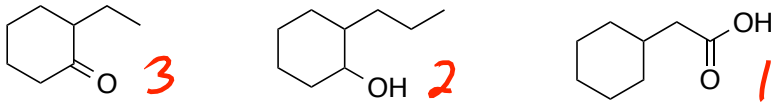




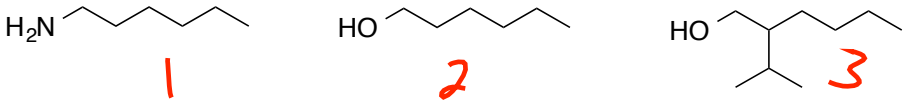
6. Rank the following, with 1 being highest, or most. (2 points each)

a. 

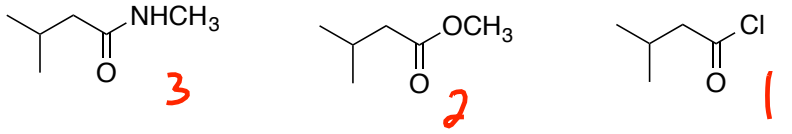
Reactivity towards nucleophilic attack (for example, by PhMgBr)

b. 

Boiling Point

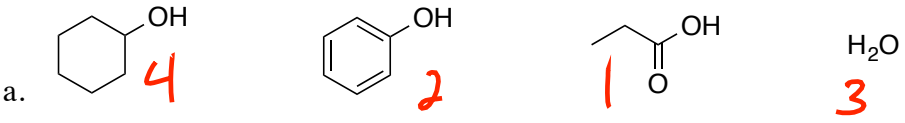
c. 

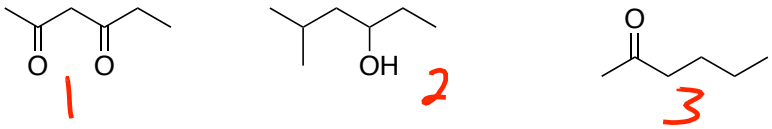
Water Solubility

d. 

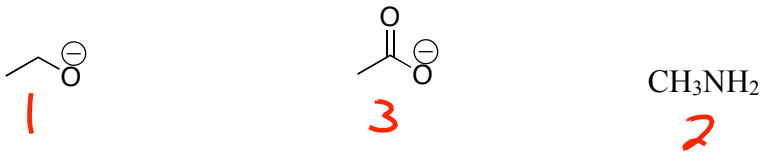
Reactivity towards nucleophilic attack

7. Rank the acidity of the following, from 1 (most) to 4 (least): (4 pts)

a. 

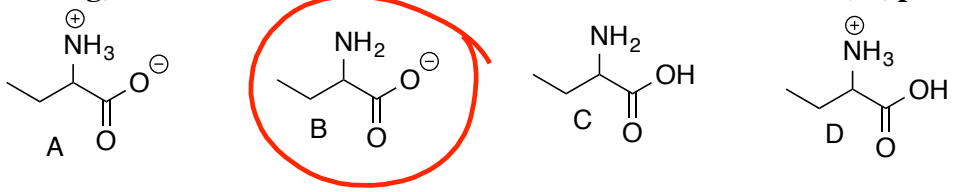
b. 

8. Rank the basicity of the following, 1 being most basic, 3 being least

a. 

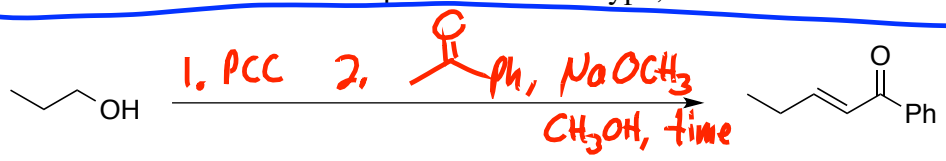
b. CH_3NHNa (1) $CH_3C(O)NH_2$ (3) $(CH_3)_3N$ (2)

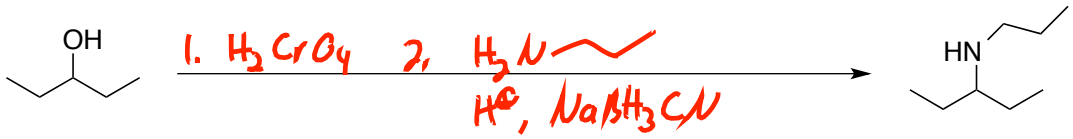
9. Of the following, which one form would exist under basic conditions? (ex, pH = 10)

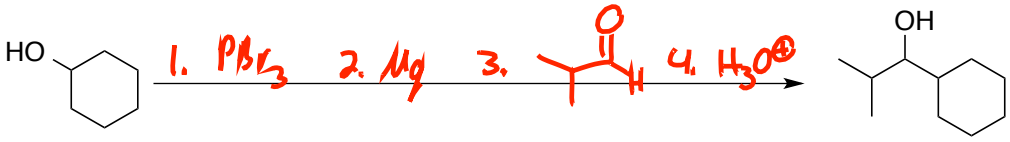


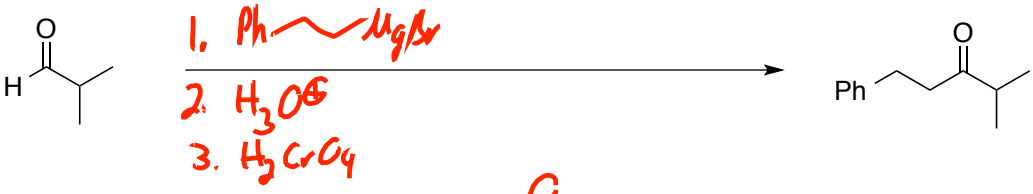
10. Provide the reagents necessary to accomplish the following transformations (4 points each). You may use anything you wish, as big as you like.

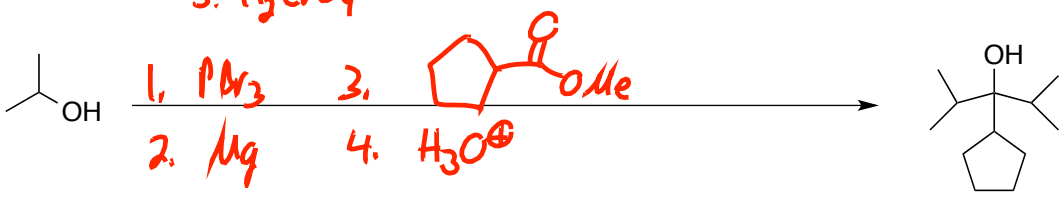
- Note 1: Real test will have 6 problems of this type, but I included more for practice

a. 

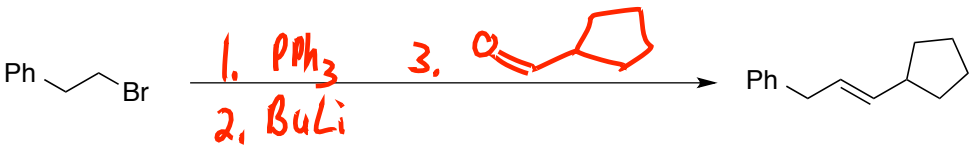
b. 

c. 

d. 

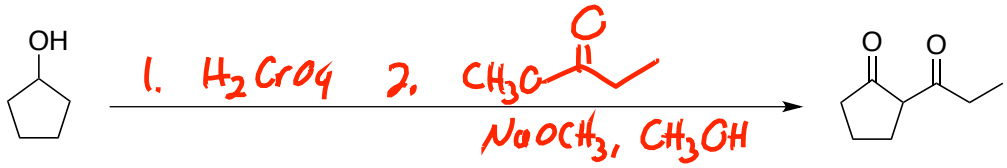
e. 

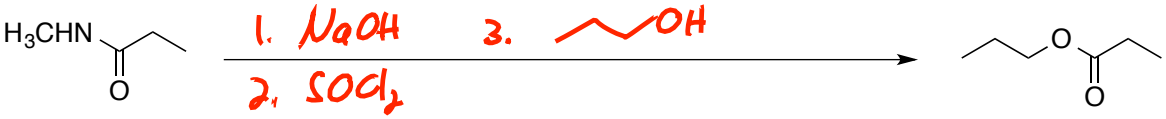
f. 

g. 

Note: no other structural isomer

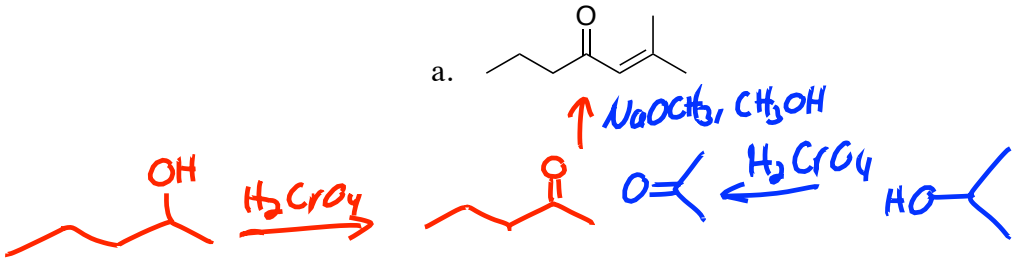
h. 

i. 

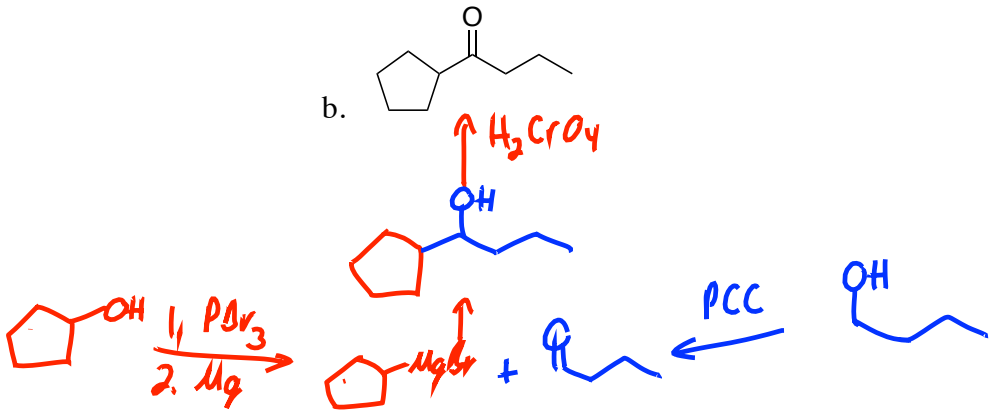
j. 

11. Retrosynthesis: Design syntheses of the following. (4 points each). Allowed starting materials include **alcohols with ≤5 carbons**; and any inorganic reagents (PCC, H_2CrO_4, PBr_3, PPh_3, BuLi, Mg, etc.)

a.

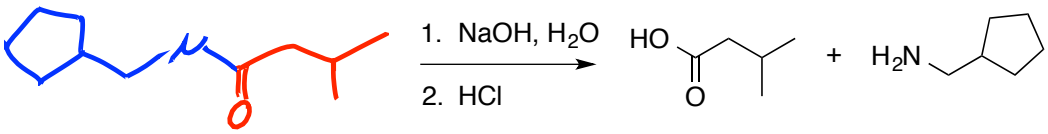


b.

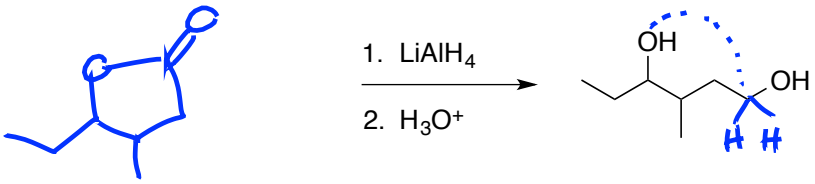


12. Put in the starting materials for the following. (Note: May be only one chemical in several of these cases). (2 points each)

a.

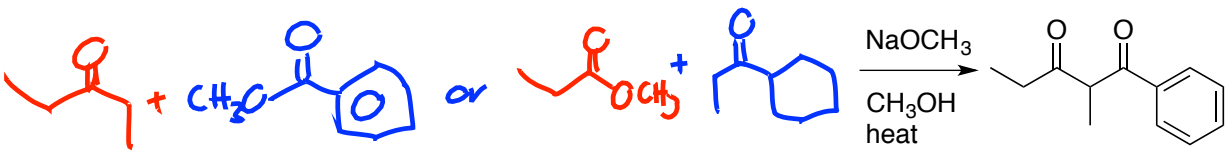


b.



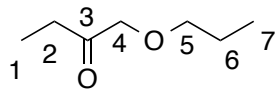
Note: Starting Material includes a ring, and has the formula $C_7H_{12}O_2$

c.



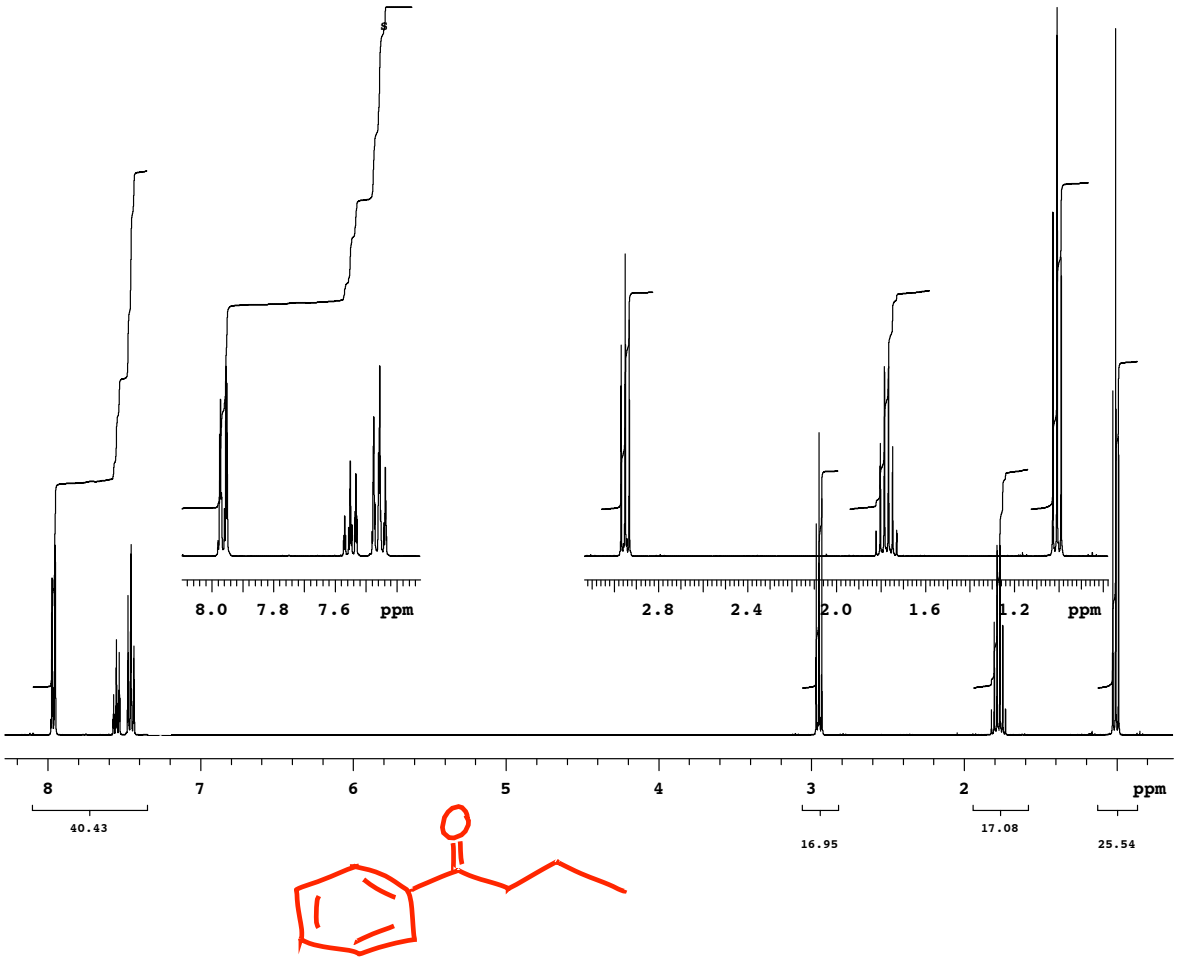
d.

13. Predict the 1H NMR spectrum. Include the source (CH_3-1, etc); approximate chemical shifts (1's, 2's, etc.); integration (1H, 2H, etc.); and splitting (either list the number of lines, or else use letters: "s" for singlet; "d" for doublet etc.). If signals are symmetry equivalent, do not list them twice. (5 pts)



Source	Chem Shift	Integration	Splitting
CH_3-1	1's	3H	3 t
CH_2-2	2's	2H	4 q
CH_2-4	4's	2 H	1 s
CH_2-5	3's	2H	3 t
CH_2-6	1's	2H	6 sextet
CH_3-7	1's	3H	3 t

14. Solve the structure (7pts): $C_{10}H_{12}O$ IR=1680



11. Solve structure (7 pts): $C_6H_{12}O_2$ IR: 1745 ^{13}C: 170(s), 70(t), 28(d), 21(q), 19(q)