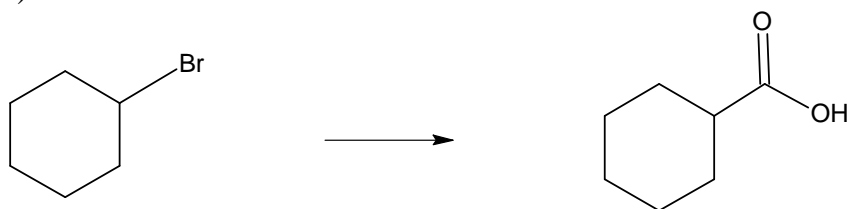


1. Complete each of the following reactions. Be sure to include stereochemistry, where appropriate. Consider several steps, where necessary. (5points each). (45 points total)

a)



1. Mg / Et₂O
2. CO₂
3. H₃O⁺

3.

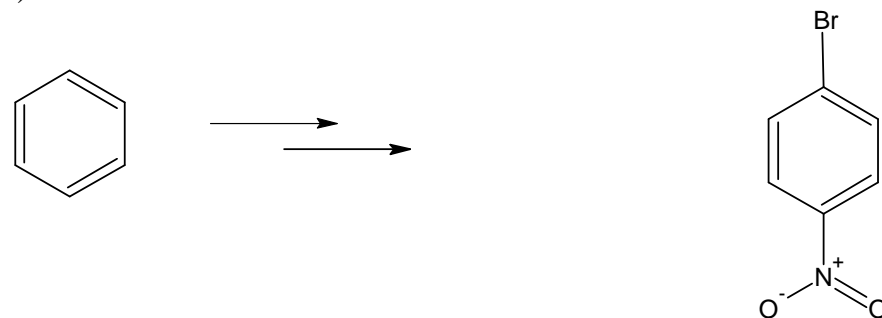
b)



1. Oxidation (K₂Cr₂O₇)

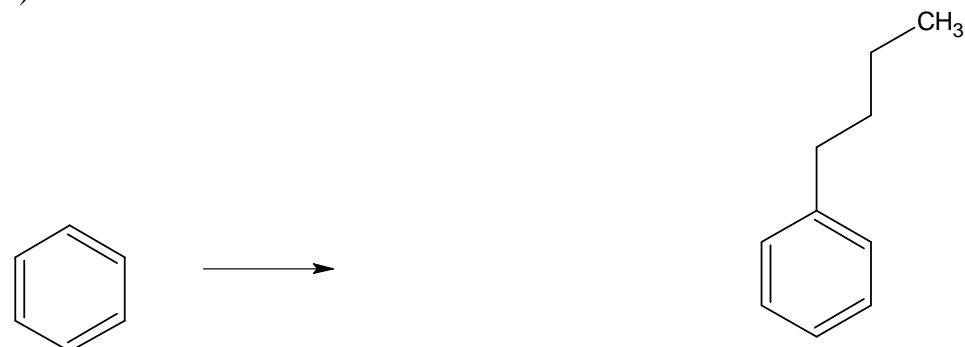
2. NaOH/ Br₂

c)

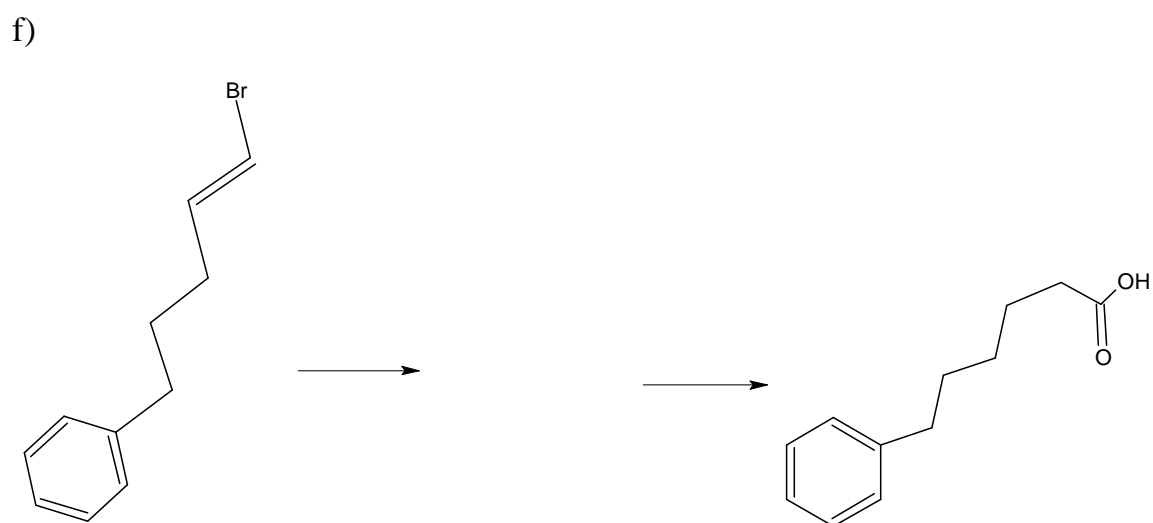
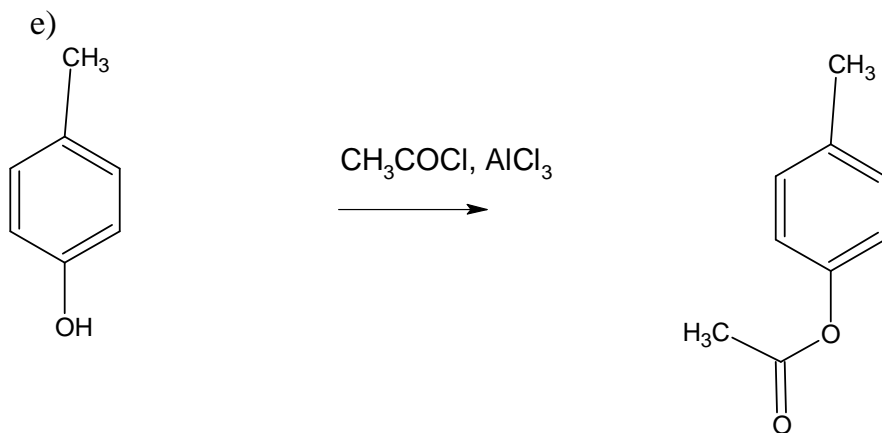


1. FeBr₃/Br₂ 2. HNO₃/H₂SO₄

d)

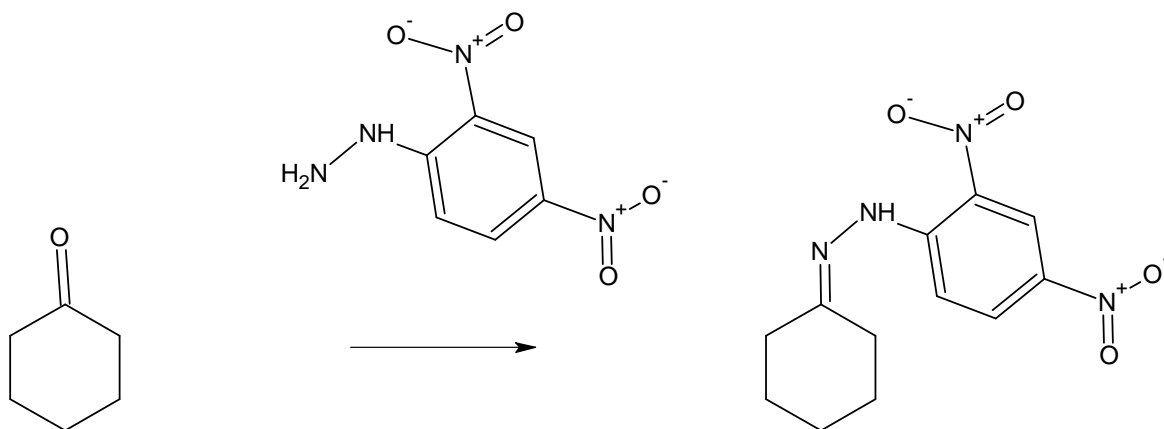


AlCl₃/ n-butyl-chloride (rearrangements); better : 1. AlCl₃/ CH₃CH₂CH₂COCl 2. Zn(Hg), HCl
See book page 621 !!

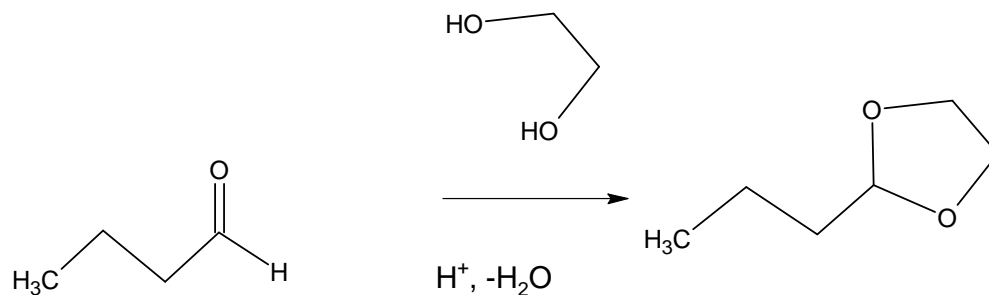


1. H_2/Pt 2. KCN ($\text{S}_{\text{N}}2$) 3. KOH (saponification)

g)



h)

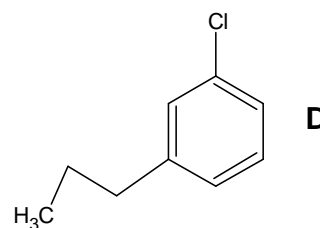
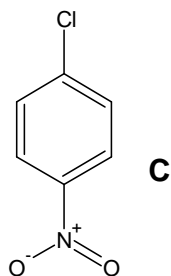
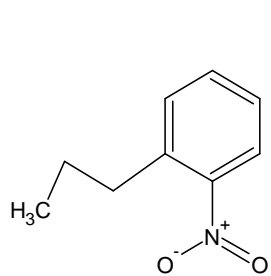
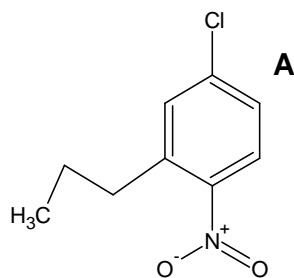


i)



1. **Ketalization (see above); 2. Reduction(LiAlH₄) 3. Hydrolysis of Ketal, H⁺**

2.) Which is the best route to synthesize the following compound (**A**), starting from the three given starting materials(second row). Give explanations why you could use only one of the three given starting materials (**B**, **C**, **D**)(10 points).

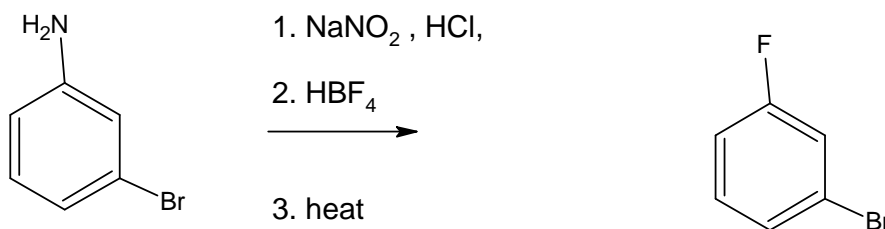


Explain how you could synthesize the correct intermediate starting from benzene (10 points).

Only possible starting material is **D**.

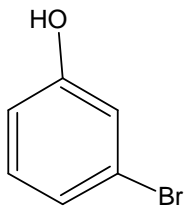
D could be synthesized through the following steps(one of a few routes):

1. $\text{CH}_3\text{CH}_2\text{CH}_2\text{COCl}$ (Friedel-Crafts-Acylation).
2. $\text{FeCl}_3/\text{Cl}_2$ (the acyl residue, step1 directs in meta position)
3. $\text{Zn}(\text{Hg}), \text{HCl}$, reduction of the Acyl-function to yield n-butyl-substituent.
3. What product you would expect from the following sequence of reactions. (10 points).



Sandmeyer reaction

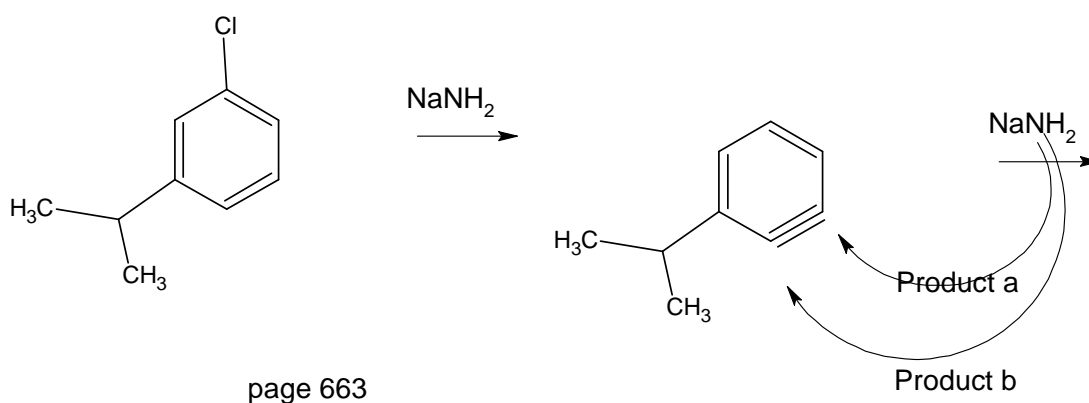
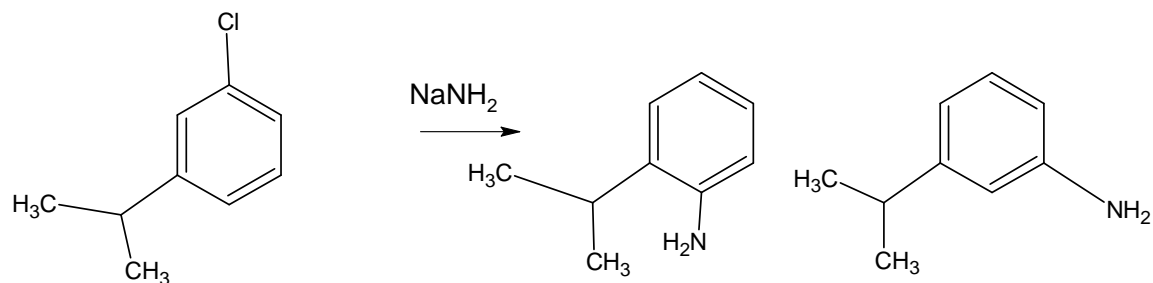
One possible byproduct is:



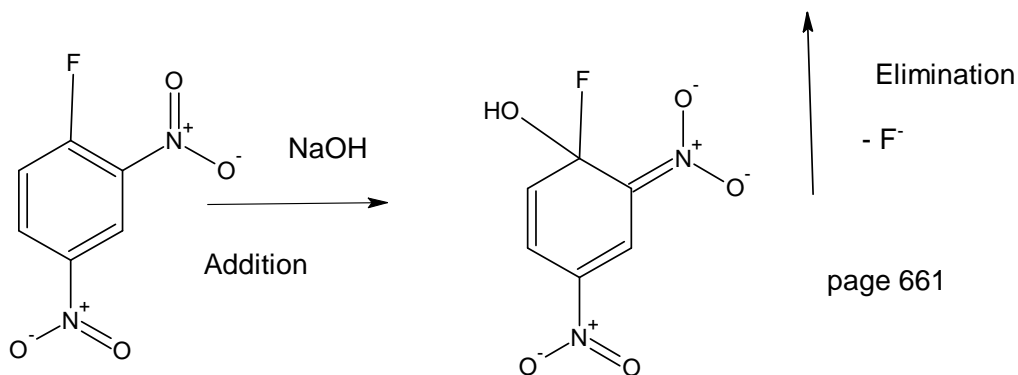
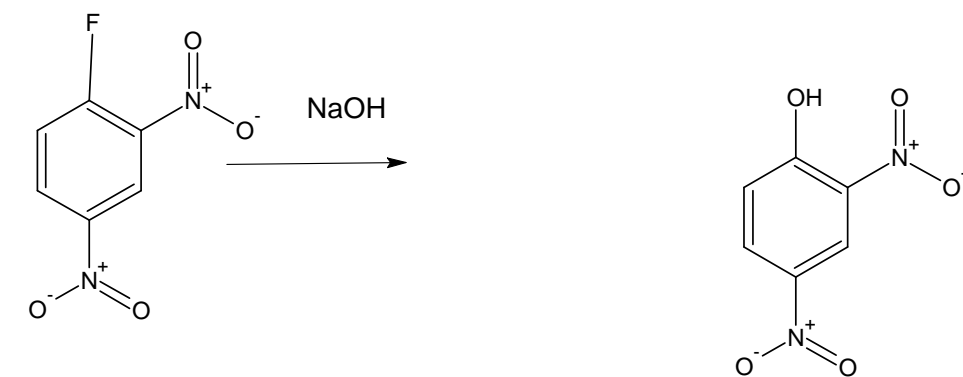
Explain what happened to produce this byproduct.

In the 1st step (Diazotation), the reaction mixture got too warm, thus H_2O (solvent for NaNO_2), reacted with the diazomium salt to produce the phenol.

4. Provide a detailed stepwise mechanism for the following reactions (5 points each).

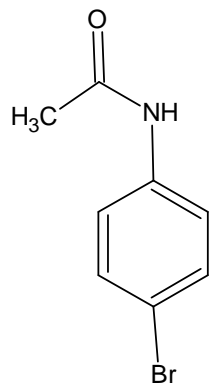


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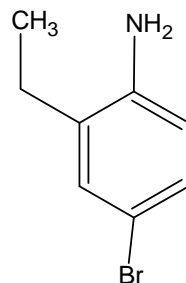


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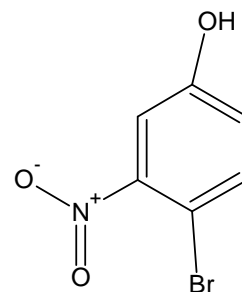
5. Give the IUPAC-name of the following compounds(2 each):



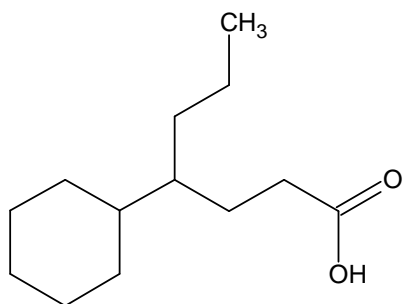
N-(4-bromophenyl)acetamide



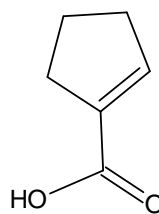
4-bromo-2-ethylaniline



4-bromo-3-nitrophenol



4-cyclohexylheptanoic acid



cyclopent-1-ene-1-carboxylic acid

6. 7. Provide a detailed stepwise mechanism for the following reactions (5 points each).

