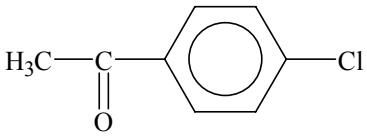
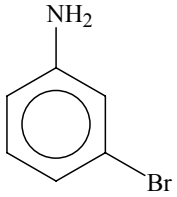
Organic Chemistry II
Problem Set 7 Solutions
Synthesis

The answers are just one of several possible for each question.

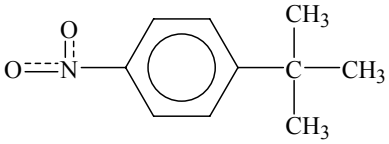
Show the steps you would use to synthesize the compounds below using toluene, benzene, any straight chain carboxylic acid, and alkyl halide with 4 or fewer carbons, and any common reagents you might need. Your solutions should show all structures.

1. 

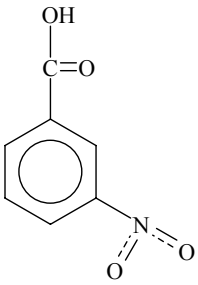
a. chlorinate toluene using Cl_2 and $FeCl_3$
b. convert acetic acid to acetyl chloride using $SOCl_2$
c. use F.C. acylation reaction to add acetyl group to chlorobenzene (purify product to remove ortho)

2. 

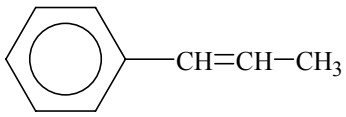
a. make nitrobenzene from benzene using HNO_3
b. add Br at meta position using Br_2 and $FeBr_3$
c. reduce the $–NO_2$ to $–NH_2$ using Sn in HCl

3. 

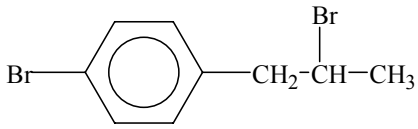
a. add t-butyl group to benzene using F.C. alkylation
b. add a nitro group using HNO_3 in H_2SO_4
c. purify to remove ortho products (not much)

4. 

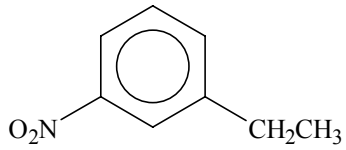
a. oxidize toluene to benzoic acid using MnO_4^{1-}
b. add a nitro group using HNO_3 in H_2SO_4

5. 

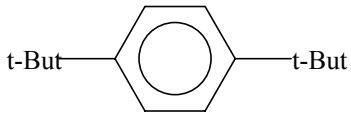
a. make propionyl chloride from propionic acid
b. use F.C. acylation to add propionyl group to ring
c. reduce the C=O to –OH using $NaBH_4$
d. heat with dilute acid to dehydrate to give product

6. 

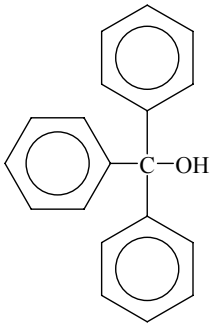
a. follow steps a. through d. from #5
b. add HBr in the presence of peroxide
c. react product from b. with Br_2 with $FeBr_3$
d. purify to remove ortho products

7. 

a. convert acetic acid to acetyl chloride using $SOCl_2$
b. add the acetyl group to benzene using F.C. acylation
c. add nitro to meta position using HNO_3 in H_2SO_4
d. reduce C=O to CH_2 using Clemmenson reduction

8. 

a. react t-butylbromide with benzene and $AlBr_3$
b. polyaklylation should occur to give product
c. some 1,3,5-tri t-butylbenzene will form by a reaction not discussed

9. 

a. convert toluene to benzyl bromide using NBS
b. convert benzyl bromide to benzyl alcohol using SN_2
c. oxidize benzyl alcohol to benzaldehyde using PCC
d. convert benzene to bromobenzene and react with Mg
e. react phenyl Grignard from d. with benzaldehyde
f. oxidize product from e. to benzophenone
g. react benzophenone with phenyl Grignard followed by acidification to give final product

You will make this product in lab via step g.