

# Problem Set Chapter 19

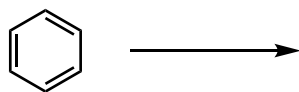
Organic Chemistry for  
Life Sciences: CHM 224

Name \_\_\_\_\_

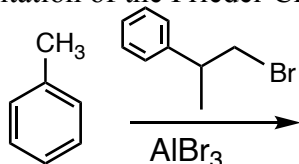
## PRACTICE Problem Set

1. Draw the structure of para-bromophenol. Provide another acceptable name for this compound.

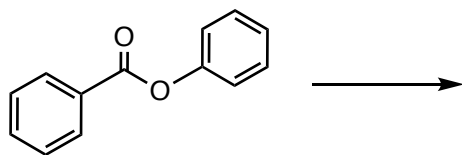
2. Provide a synthesis of tert-butylbenzene starting with benzene and any other necessary reagents.



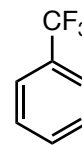
3. What would be the expected product of the following Friedel-Crafts reaction (HINT: remember the major limitation of the Friedel-Crafts alkylation process!):



4. The compound below has two benzene rings. If only *1 equivalent* of HNO<sub>3</sub>, H<sub>2</sub>SO<sub>4</sub> is added, which ring would be preferentially nitrated? What would be the product(s) of the reaction resulting from reaction at that ring?



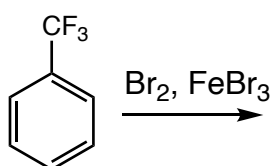
Open the "Model Kit" from the course webpage. Click on "Name" under "Load Models" and type in trifluoromethylbenzene which has the structure provided. Then click on "Draw" under "Load Models", click on the benzene ring and click once to add a benzene molecule. Click on "Append Molecule". Both benzene and trifluoromethylbenzene should be visible on the screen. Click "MEP" under "Other Model Actions" to create the electrostatic potential map for both compounds and answer the two questions below.



trifluoromethylbenzene

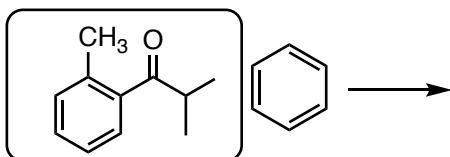
5. Based on the amount of electron density at the center of the benzene ring as revealed by the electrostatic potential map, is the CF<sub>3</sub> group acting as an electron donating or as an electron-withdrawing group? Briefly explain.

6. Based on what was learned from question 6, what is(are) the expected product(s) of the following reaction:

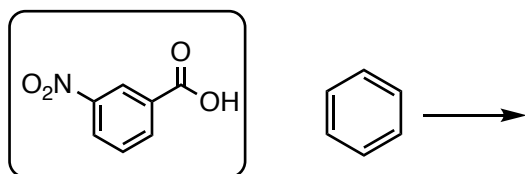


7. Will reaction of trifluoromethylbenzene with HNO<sub>3</sub>/H<sub>2</sub>SO<sub>4</sub> be faster or slower than the reaction with benzene under otherwise identical reaction conditions? Briefly explain.

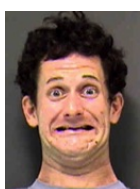
8. Provide a reasonable stepwise synthesis for the following compound starting from benzene and showing required reagents and each intermediate compound:



9. Provide a reasonable stepwise synthesis for the following compound starting from benzene and showing required reagents and each intermediate compound:



10. Jimmy predicts that 4 major products will be formed in the reaction below. Is Jimmy correct? If not, draw the predicted product(s)



Jimmy

