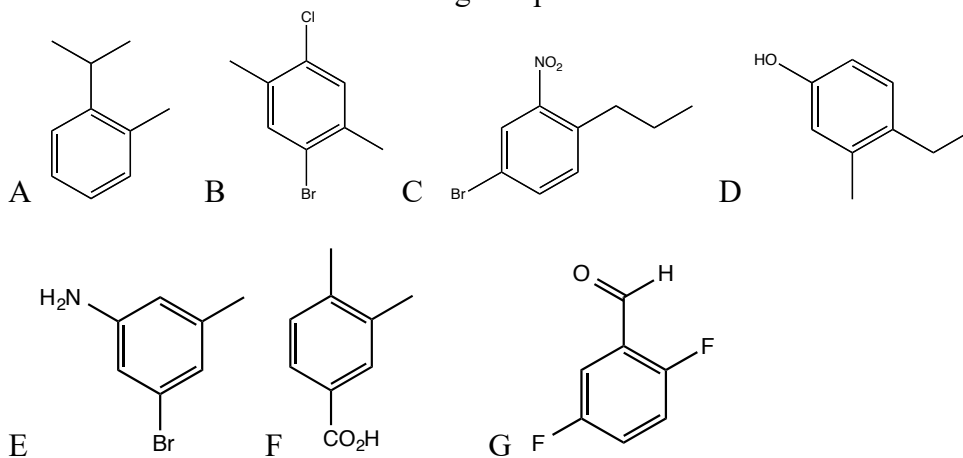
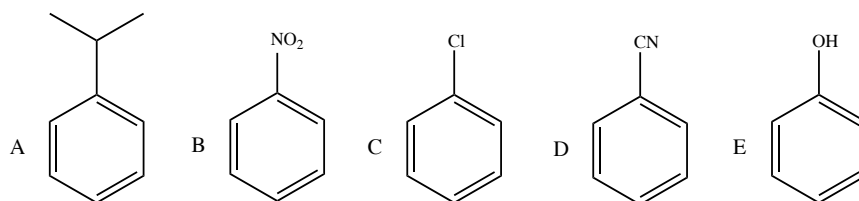


Chapter 19 Practice Problems

1. Provide IUPAC names for the following compounds



2. Predict the major product(s) formed by matching each of the substituted benzenes below (A- E) with each of the reagents (I - V) individually:



I. $\text{Br}_2, \text{FeBr}_3$

II. $\text{HNO}_3, \text{H}_2\text{SO}_4$

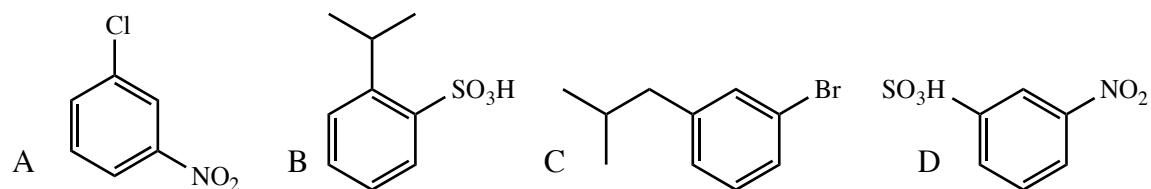
III. $\text{SO}_3, \text{H}_2\text{SO}_4$

IV. $\text{CH}_3\text{CH}_2\text{Cl}, \text{AlCl}_3$ (Friedels Craft alkylation reaction will not work on benzene rings with strong electron withdrawing groups, so NO REACTION with B and D)

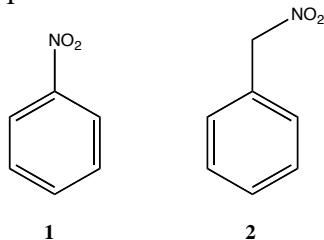
V. $\text{I}_2, \text{CuCl}_2$

VI. $\text{CH}_3\text{CH}_2(\text{CO})\text{Cl}$ (Friedels Craft acylation reaction will not work on benzene rings with strong electron withdrawing groups, so NO REACTION with B and D)

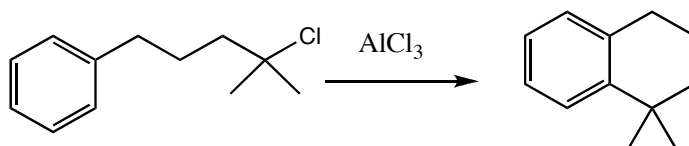
3. Starting from benzene and any other needed reagents, provide a synthesis for each of the following compounds:



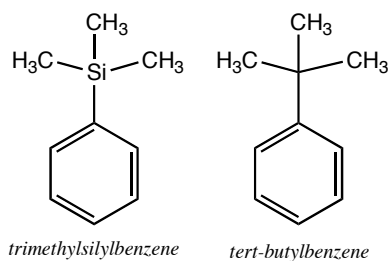
4. Compound **1** and **2** were both treated with $\text{Br}_2/\text{FeBr}_3$. Compound **1** resulted in 95% bromination at the meta site. Similar reaction with compound **2** only resulted in 55% bromination at the meta site. Explain this observation.



5. Explain how the following reaction might take place (HINT: consider the steps of a Friedel-Crafts alkylation):

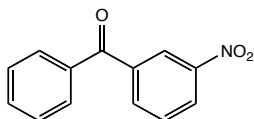


6. The rate of bromination of trimethylsilylbenzene (below) is twice as fast as benzene but three times slower than the reaction with *tert*-butylbenzene. Given this information:

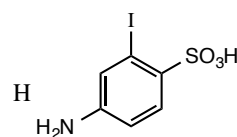
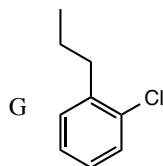
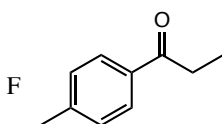
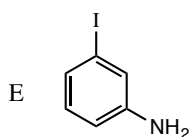
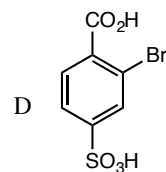
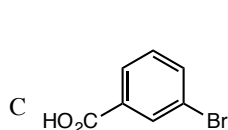
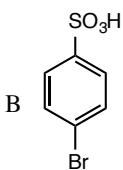
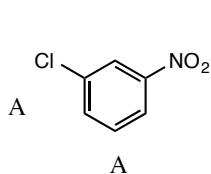


- i. Is the trimethylsilyl group an electron donating group or an electron withdrawing group? Explain
- ii. What are the relative strengths of electron donating ability of the trimethylsilyl group and the *tert*-butyl group?
- iii. Draw the expected major product(s) from bromination of trimethylsilylbenzene
- iv. In the bromination of *tert*-butylbenzene, the major product is the *para-tert*-butylbromobenzene with only a small amount of *ortho* product detected. Why is this?

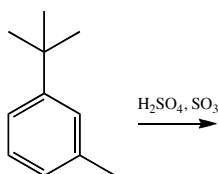
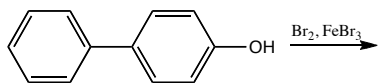
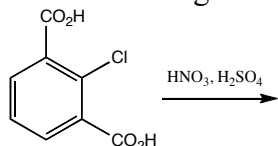
7. The following compound was made by a Friedel-Crafts acylation reaction. There are two potential ways to make it, what are they? Which would be best? And why?



8. Starting from benzene and any other needed reagents, provide a synthesis for each of the following compounds:



9. Each of the following reactions gives single major product. Draw the product.



10. What would be the names of the following compounds?

