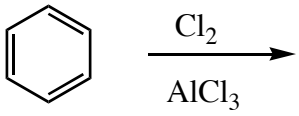
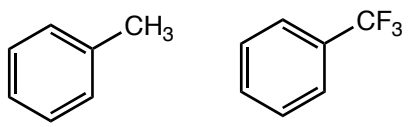
# Homework for Chapter 18
# Chem 2320

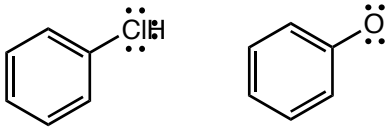
Name _____

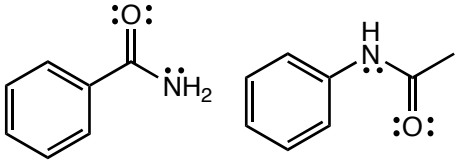
1. Draw the complete mechanism for a reaction between benzene and the complex formed between chlorine and $AlCl_3$.

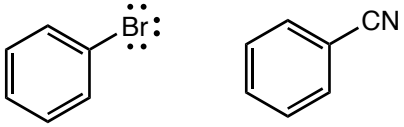


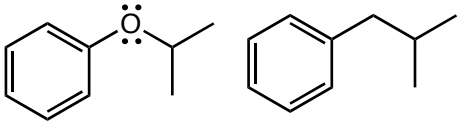

2. Circle the starting material which will react <u>faster</u> under electrophilic aromatic substitution conditions.

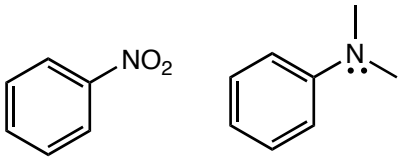
a) 


b) 


c) 


d) 

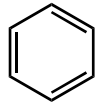
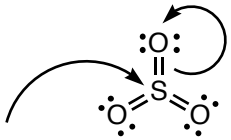
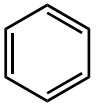
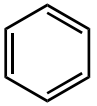
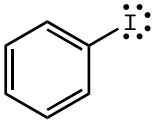
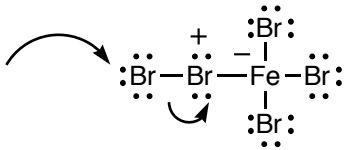
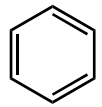
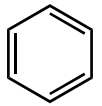
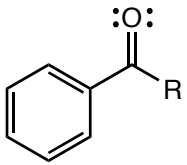

e) 


f) 


3. Draw the resonance structures of the following intermediates, and explain why the intermediate (as a whole) is stabilized, destabilized, or neither relative to a benzene ring.

a) chlorination of isopropylbenzene at the para position

4. Fill in all of the missing elements in the following table. Draw arrows to indicate how the electrophile is attacked.

| name of reaction | reagents | electrophile | product |
|---|---|---|---|
| nitration | → | |  |
| | → |  |  |
| | $\xrightarrow[AlCl_3]{Cl_2}$ | |  |
| | → | |  |
| | → |  |  |
| Friedel-Crafts alkylation | → | |  |
| | → | |  |

b) sulfonation of nitrobenzene at the para position

c) bromination of acetophenone at the ortho position

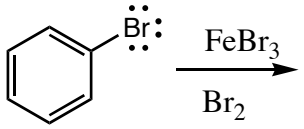
d) nitration of benzonitrile (benzene ring with a nitrile attached) in the meta position

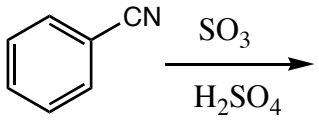
e) iodination of phenol in the para position

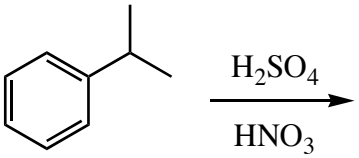
f) bromination of ethoxybenzene in the meta position

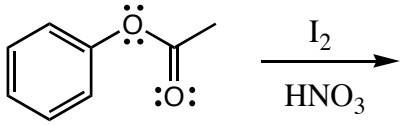
g) nitration of bromobenzene at the ortho position

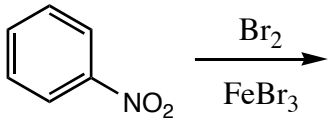
5. Give the products of the following reactions (don't show those with only a minimal amount of product).

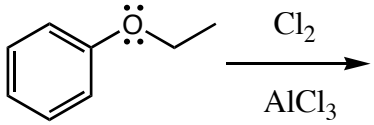
a) 

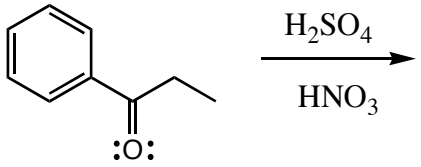

b) 

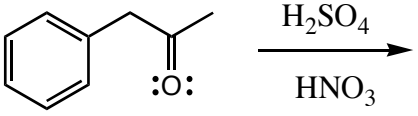

c) 


d) 

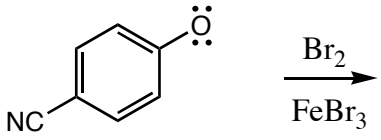

e) 

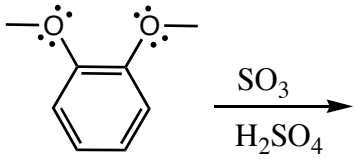

f) 

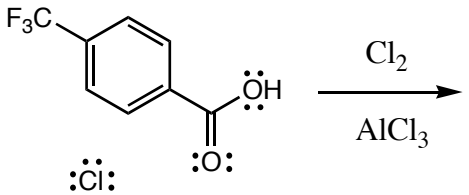

g) 

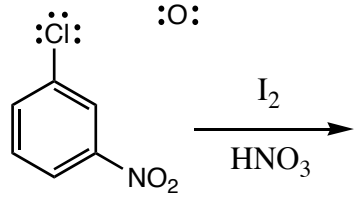

h) 

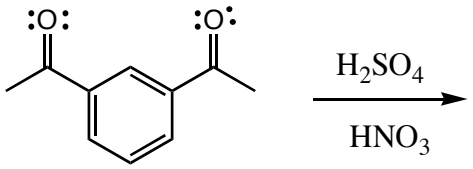
6. Give the products of the following reactions and indicate whether the substituents are reinforcing or conflicting.

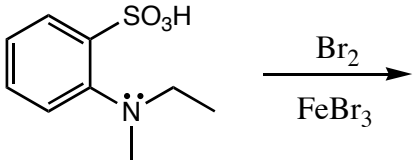
a) 

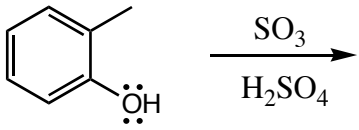

b) 

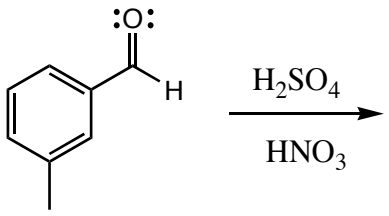

c) 


d) 

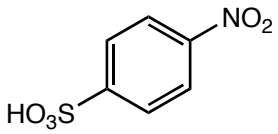

e) 


f) 


g) 

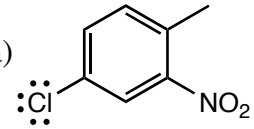

h) 

7. Why is it impossible to synthesize the following compound from benzene? Explain thoroughly!




8. Synthesize the following from toluene. Assume that constitutional isomers can be separated, including multiple substitutions from Friedel-Crafts alkylations.

a)

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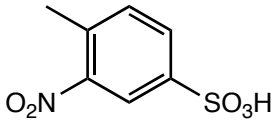
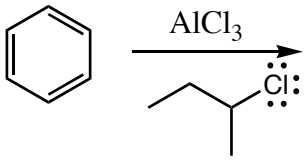


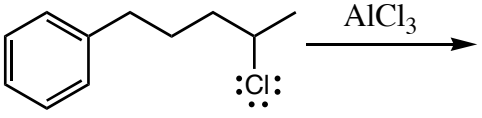

9. Give the product(s) of the following reactions. Where multiple substitution may occur, show at least one disubstituted product.

a)




b)


c)

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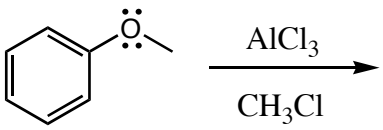
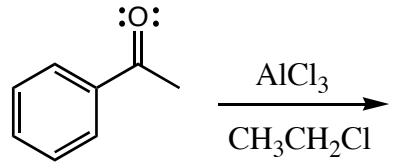
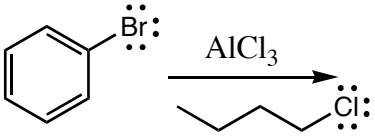
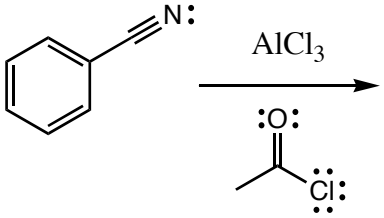
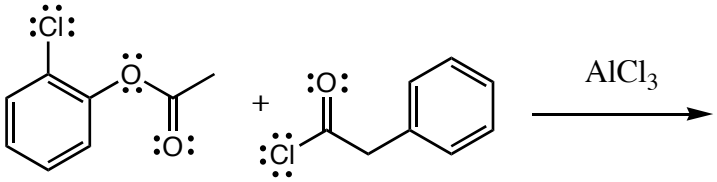


f) 

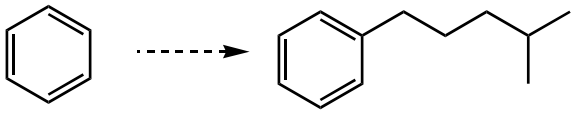

g) 

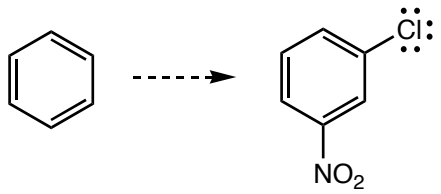

h) 

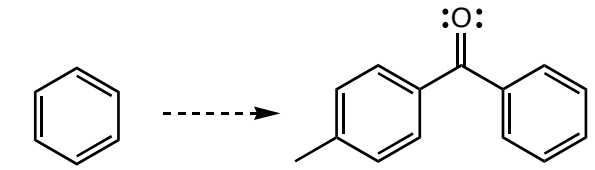

i) 

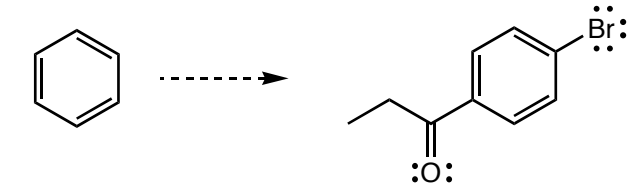

j) 

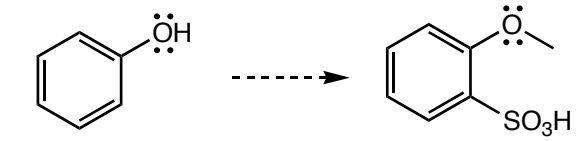

10. Write out a reaction sequence including reagents and intermediate products by which the following compound can be synthesized from those shown. Reactions from previous chapters will be needed in some cases!

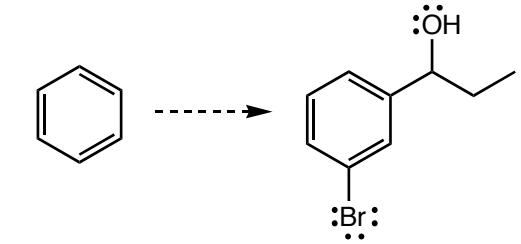
a) 

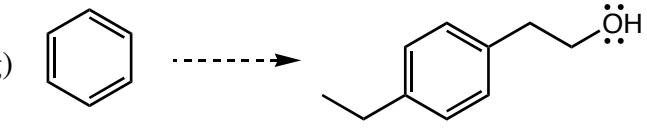
b) 

c) 


d) 

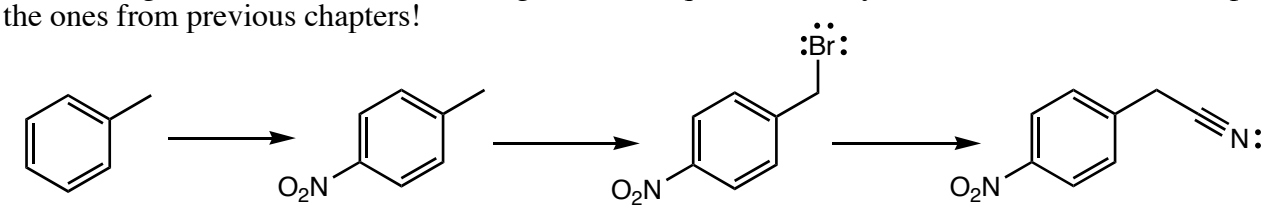

e) 


f) 


g) 

11. Give the reagents needed for the following reaction sequences. Use your o-chem notebook to help with the ones from previous chapters!

a)

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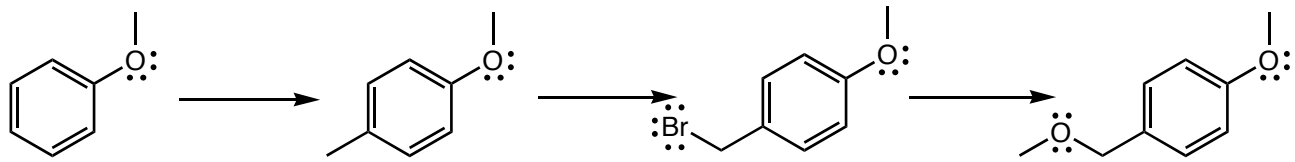


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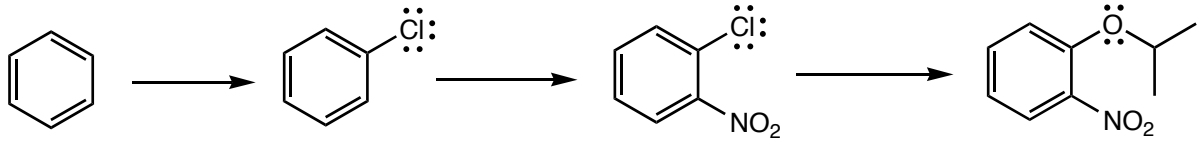


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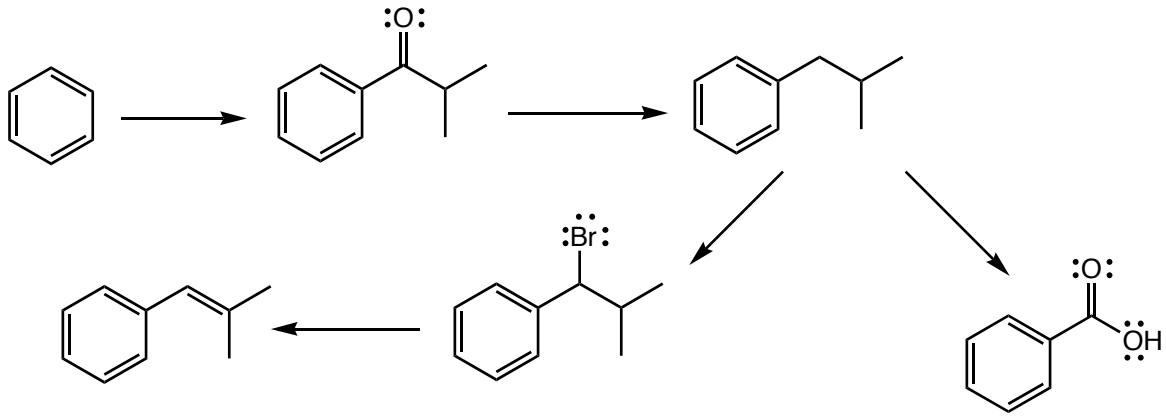


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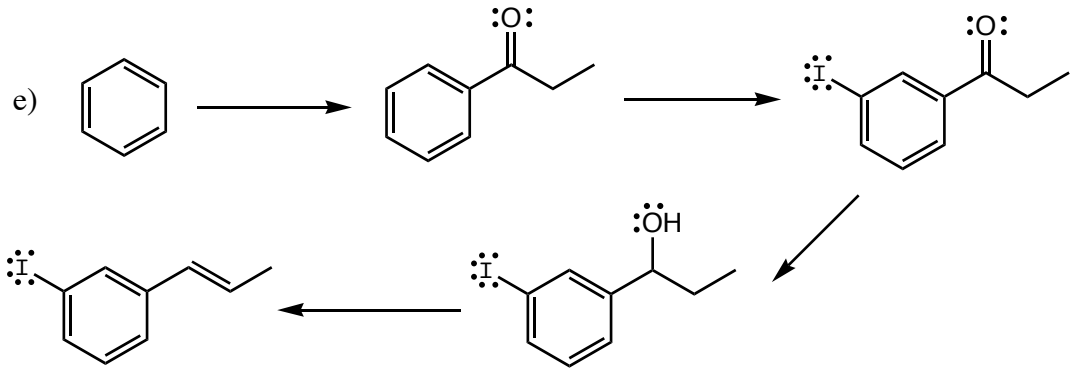


f)