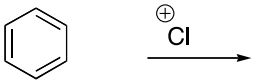
16A. Draw the mechanism of electrophilic aromatic substitution.

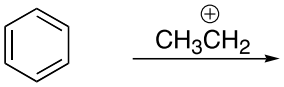
OCSL: 3.1 - 3.4, 3.16, 3.17, 3.28

16A.1 Predict the product and provide a mechanism for the following reactions. Include intermediates and curved arrows to show electron flow.

a)

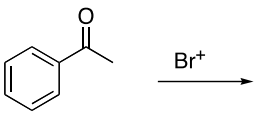


b)

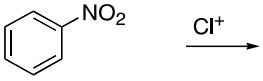


c)

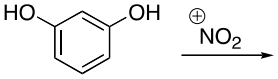
d)



e)



f)

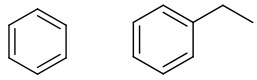


16B. Predict how substituents effect the rate of reaction.

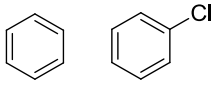
OCSL: 3.57 – 3.67

16B.1 Circle the more activated ring in each pair.

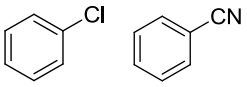
a)



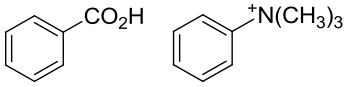
b)



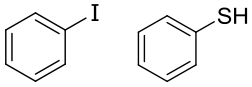
c)



d)

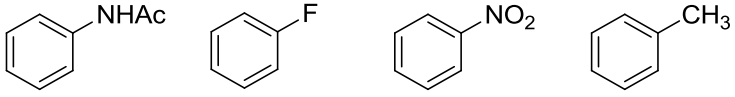


e)

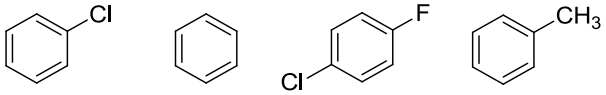


16B.2 Order the following sets from the most reactive (#1) to the least reactive (#4).

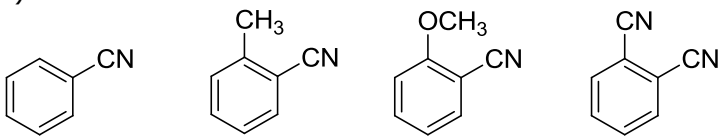
a)



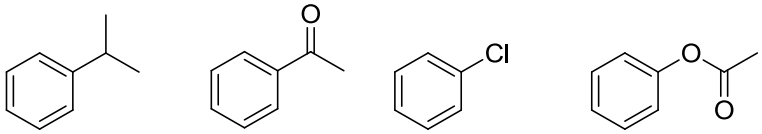
b)



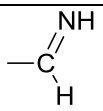
c)



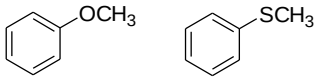
d)



16B.3 Classify the electronic effects for each of the substituents as being withdrawing, donating or neither.

	—OCH_3	—CH_3	—SCH_3	
Inductive Effect				
Resonance Effect				

16B.4 Compound **A** reacts faster to electrophillic substitution than **B**. Explain this in terms of induction and resonance effects.



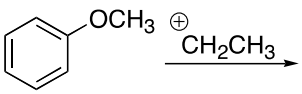
A **B**

16C. Use sigma complexes to explain how substituents effect the regiochemistry of reaction.

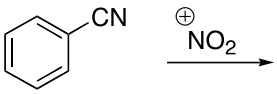
OCSL: 3.5 - 3.8, 3.9 - 3.15, 3.23 - 3.27, 3.30 - 3.56, 3.69 - 3.79, 3.86 - 3.92, 8.26 - 8.30

16C.1 For each reaction, draw resonance structures of the sigma complexes for the ortho, meta, and para positions. Explain how the resonance structures predict the favored product(s).

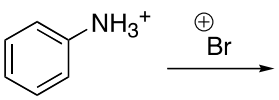
a)



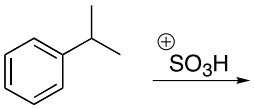
b)



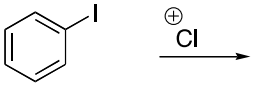
c)



d)



e)

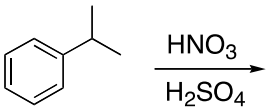


16D. Predict the products of the following reactions with aromatic rings: halogenation, nitration., sulfonation, Friedel-Crafts alkylation, Friedel-Crafts acylation, benzylic bromination, permanganate oxidation, Clemmson reduction, Wolf-Kishner Reduction, protection and deprotection of anilines with acyls, formation and reaction of diazonium salts.

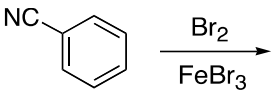
OCSL: 3.5 - 3.8, 3.9 - 3.15, 3.23 - 3.27, 3.30 - 3.56, 3.69 - 3.79, 3.86 - 3.92, 8.26 - 8.30

16D.1 Predict the major product(s) of the following reactions. If no reaction write "NR".

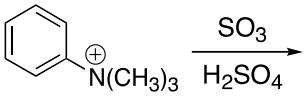
a)



b)



c)



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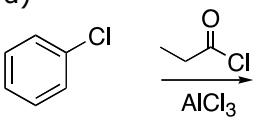
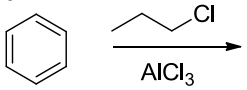
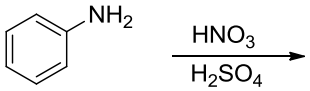


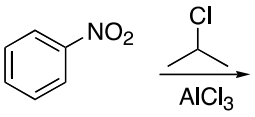
e)



f)

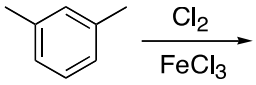


g)

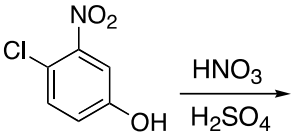


16D.2 Predict the major product(s) of the following reactions. If no reaction write "NR".

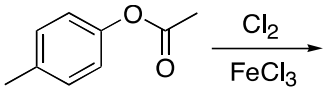
a)



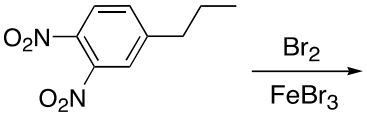
b)



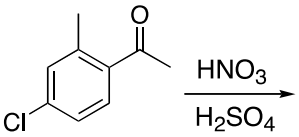
c)



d)



e)



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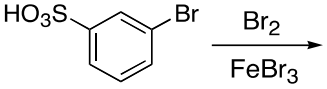
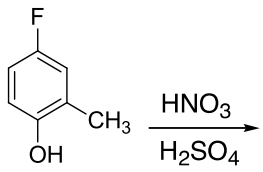
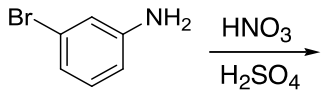


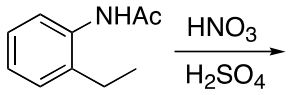
g)



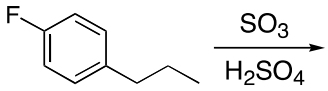
h)



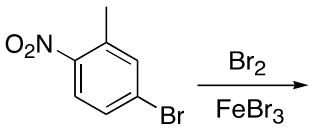
i)



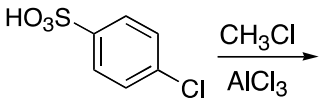
j)



k)

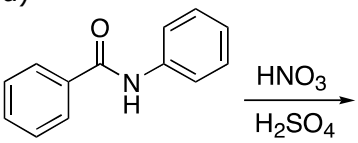


l)

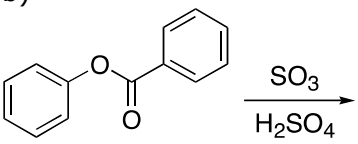


16D.3 Predict the major product(s) of the following reactions. If no reaction write "NR".

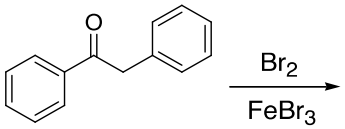
a)



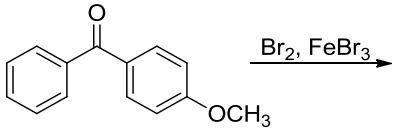
b)



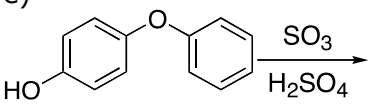
c)



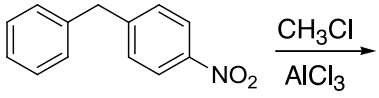
d)



e)

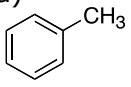


f)

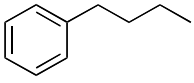


16D.4 Predict the major product of the following molecules reacted with $KMnO_4$.

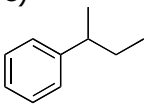
a)



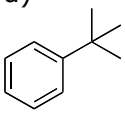
b)



c)



d)



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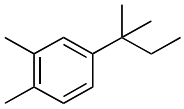
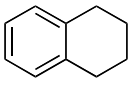
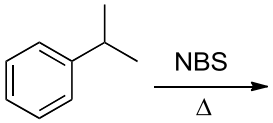


f)

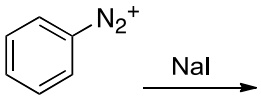


16D.5 Predict the major product(s) of the following reactions. If no reaction write "NR".

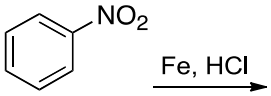
a)



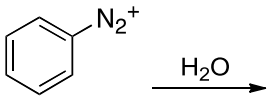
b)



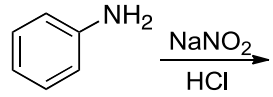
c)



d)



e)



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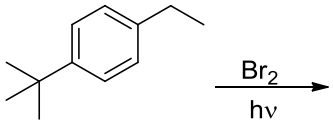

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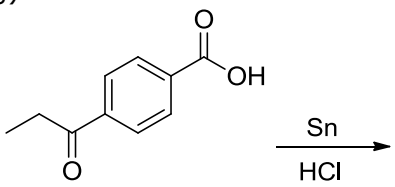
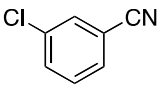


16E. Propose multistep syntheses of polysubstituted aromatics.

OCSL: 3.93 - 3.102, 8.23 - 8.25, 8.31 - 8.36

16E.1. Propose a multistep synthesis of the following compounds from benzene.

a)



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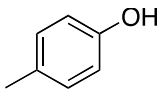

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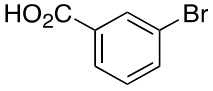

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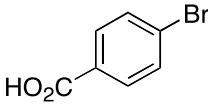

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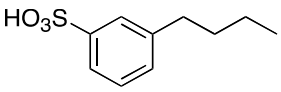

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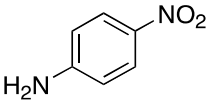

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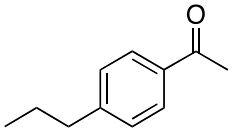

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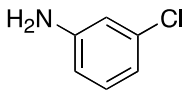

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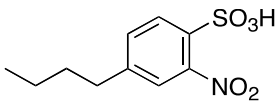

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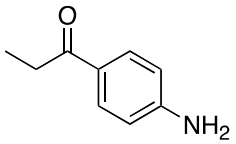

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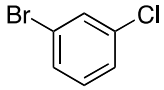

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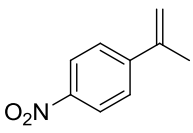

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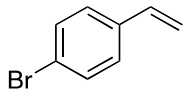

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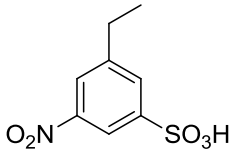
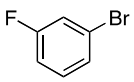


o)



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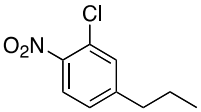
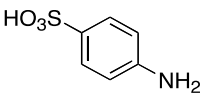


q)



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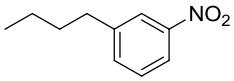

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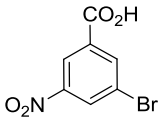

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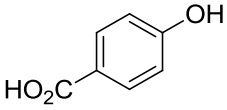
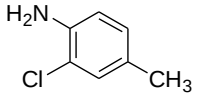


u)



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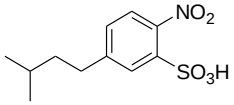

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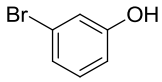

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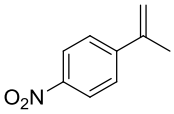
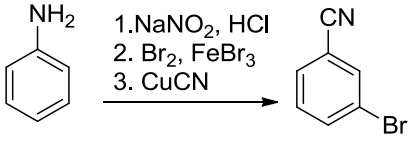


16E.2 The following syntheses are flawed. Explain what is wrong with each.

a)



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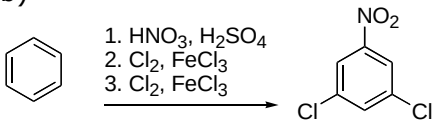

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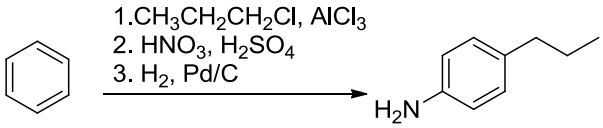

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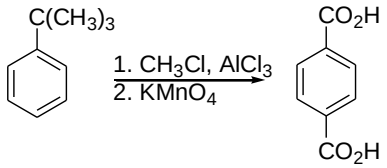

e)