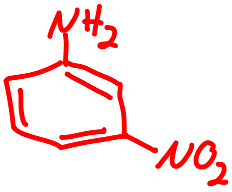
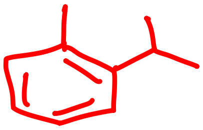
JASPERSE CHEM 350 TEST 4 VERSION 2
Conjugation, Aromatic Compounds, Reactions of Aromatic Compounds

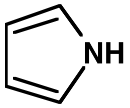
1. Provide the Name of Structure for the following. (7 points)

a. 3-nitroaniline



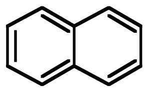
b. o-isopropyltoluene

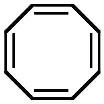


c. 

Pyrrole

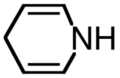
2. Circle the aromatic molecules. (7 points)

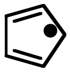




8 π electrons

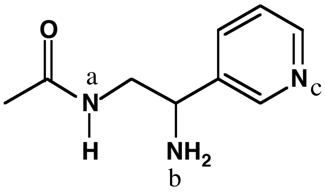
sp³ →





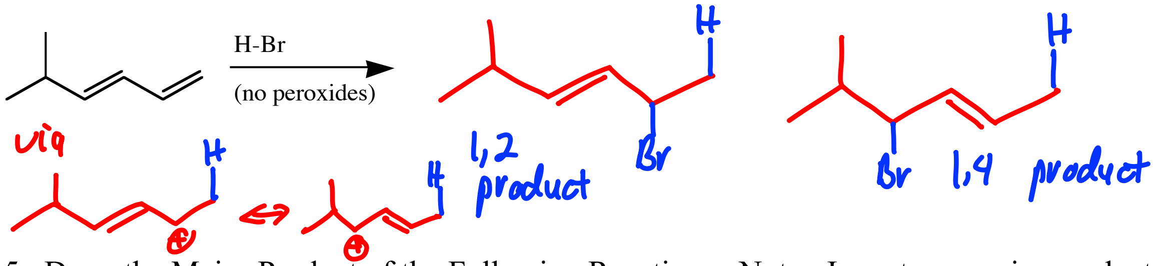
acyclic

3. The molecule has 3 different nitrogens. For each of them, classify the hybridization of the nitrogen atom, the hybridization of the nitrogen lone pair, and whether the basicity of the nitrogen is "normal" or "low". (6 points)



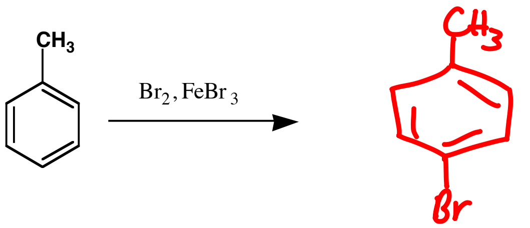
	Nitrogen Hybridization	Lone-Pair Hybridization	Nitrogen Basicity
N^a	sp^2	p	low
N^b	sp^3	sp^3	normal
N^c	sp^2	sp^2	normal

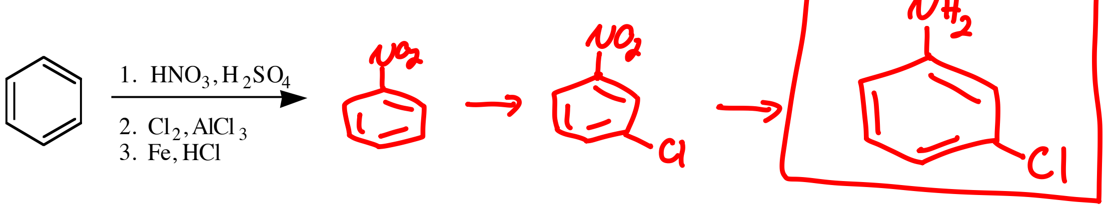
4. Draw the major products of the following reaction (4 points).

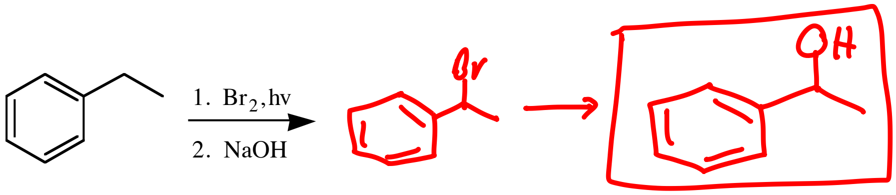


5. Draw the Major Product of the Following Reactions. Note: I want one major product in each case. (3 points each)

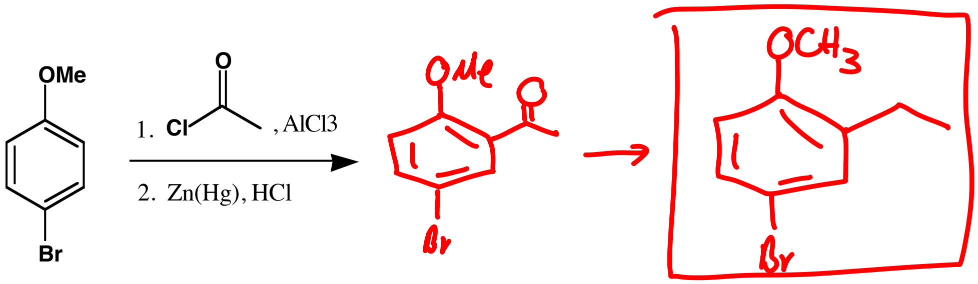
Note: This answer key is showing intermediates along the pathway for multi-step reactions, so it's easier for students to see how the final product was formed. But for test grading, all I would need is the final product.

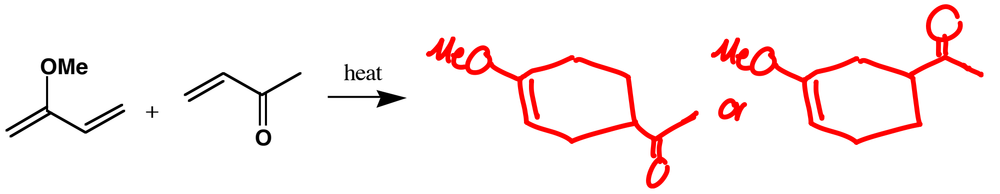




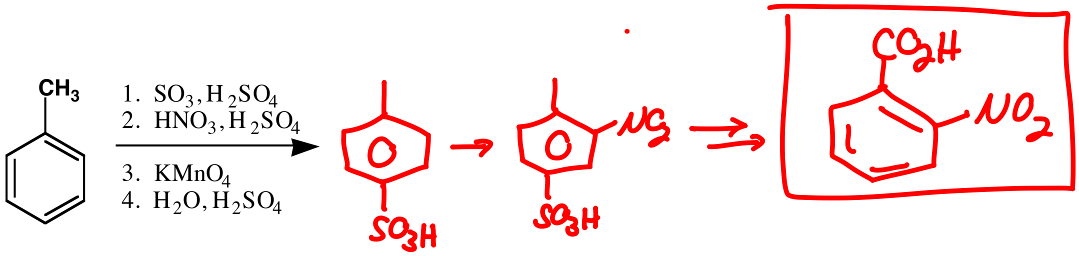


1. Radical bromination on allylic spot
2. Hydroxide does SN2 >>> E2.
-Small nucleophile, and SN2 is greatly accelerated by being allylic

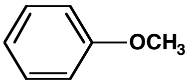




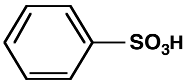
Note: Either of two structural isomers is acceptable as answer. First actually predominates, but that wasn't covered in class.



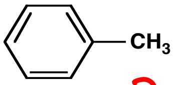
6. Rank the following, with 1 being highest/most. (2 points each)



1



3



2

Reactivity toward
Br_2, $FeBr_3$

Strong donor/activator > weak donor/activator > withdrawer/deactivator

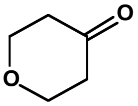
3

2

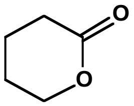
1

Heat of
hydrogenation

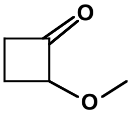
More stable => less heat.
1. Conjugation.
2. Substitution level.



2



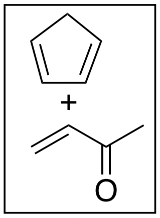
1



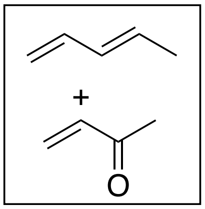
3

Stability

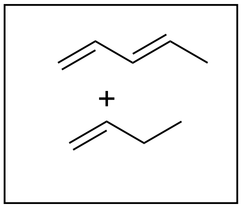
1. Conjugated vs isolated.
2. Ring strain



1



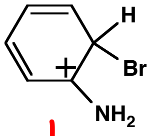
2



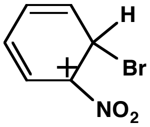
3

Combined
Diels-Alder
Reactivity

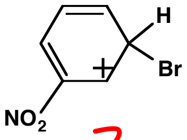
1. Cyclopentadiene is always s-cis
2. Electron withdrawing group activates dienophiile



1



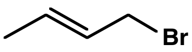
3



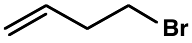
2

Cation
Stability

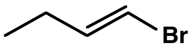
1. NH2 is a strong cation stabilizer
2. NO2 is a strong cation de-stabilizer



1



2

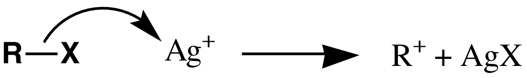


3

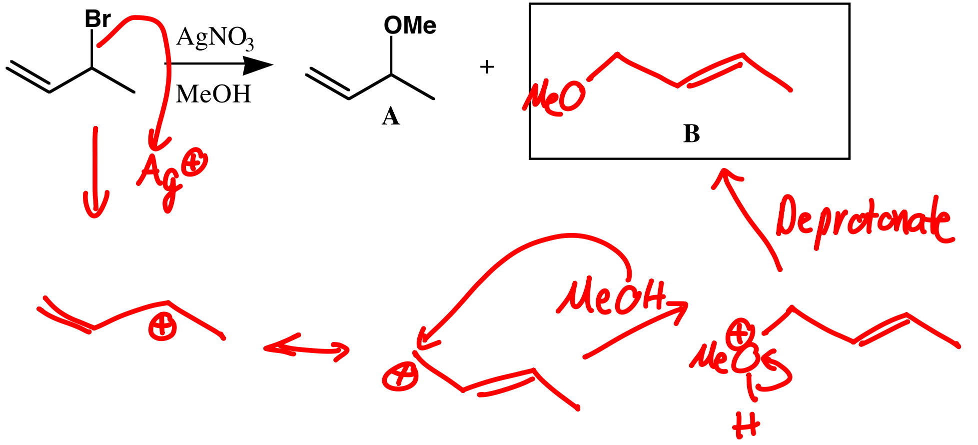
Reactivity
toward NaOMe

For SN2,
1. vinyl/aryl is bad.
2. Allylic accelerates

8. Treatment of an alkyl halide with methanolic $AgNO_3$ often promotes ionization, via the following:



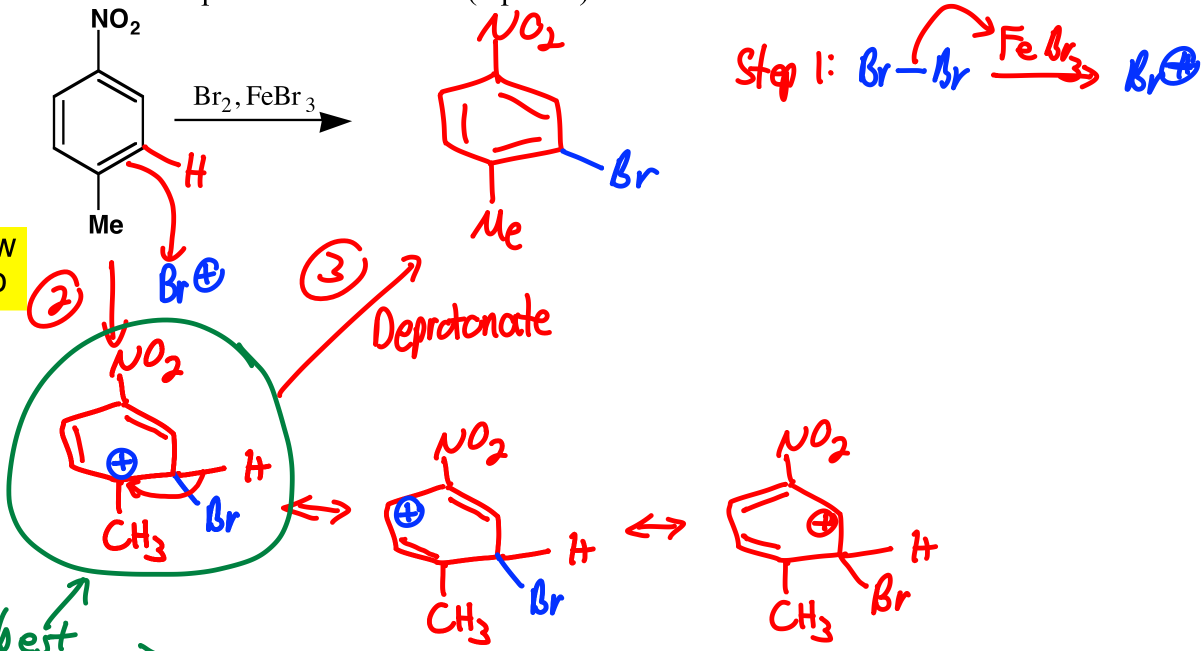
When 3-bromo-1-butene undergoes this reaction, two isomeric products **A** and **B** are formed. Draw the structure for product **B** and the detailed mechanism for formation of product **B**. (7 pts)



SN1 mechanism, but since it passes through an asymmetric allylic cation, the second product is available via the second resonance structure.

9. Draw the product for the following reaction and draw the mechanism for its formation. Identify the slow step. Draw all the resonance structures for the cation intermediate and circle the most important contributor. (7 points)

Slow step

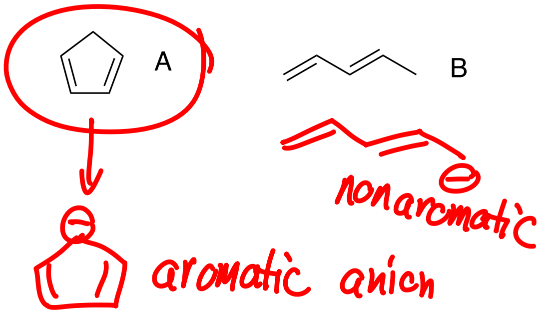


best resonance.
Donor/cation stabilizer next to cation

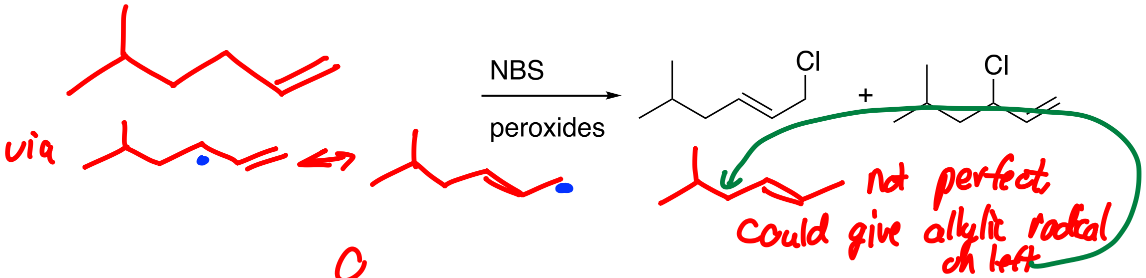
3 resonance

10. (3 pt) When comparing cyclopentadiene (**A**) versus 1,3-pentadiene (CH_2=CH-CH=CH-CH_3, **B**), one is much more acidic. Circle the more acidic chemical, and explain why it is much more acidic.

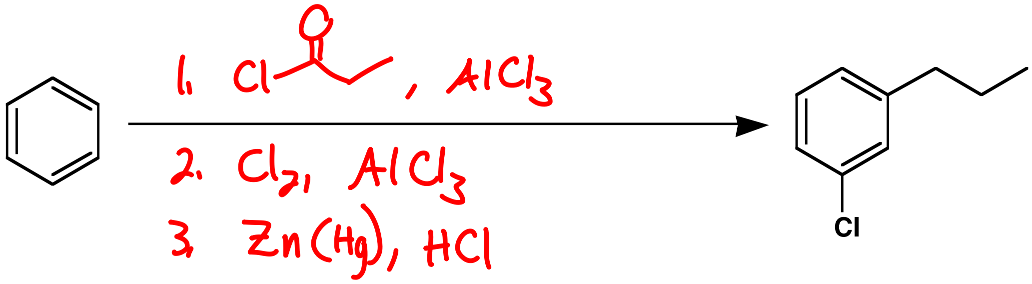
Since acidity involves donating a proton and getting one charge unit more negative, any neutral acid will create an anion.
The cyclopentadiene anion is aromatic.



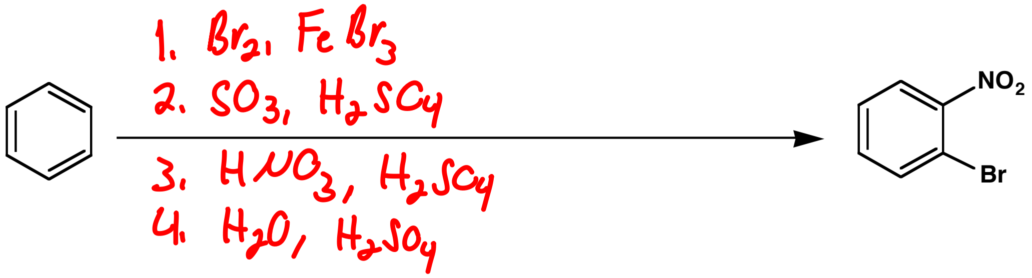
11. Draw the Reactants for the Following Reactions (6 points)



12. Provide reagents for the following transformations. (5 points each)



Notes:
1. For 1° alkyl, need to go in via acyl group. 1° alkyl cations have problems.
2. Sequence: must be as shown. The acyl group (carbonyl) is a meta director.



Sequence must be as shown.
Need o/p-directing Br first, prior to the meta-directing NO2. And need the sulfonation to block the para position, otherwise nitro would mostly go para not ortho.