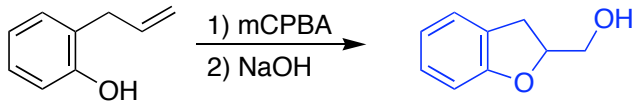
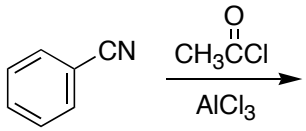
(1) Predict the major product from each reaction. If you expect no reaction, indicate.

(a)

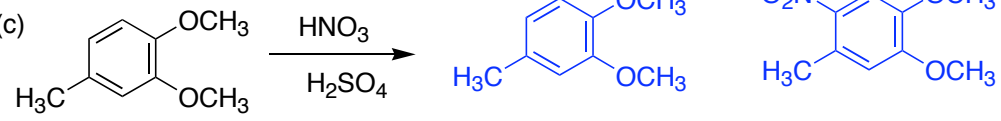



(b)

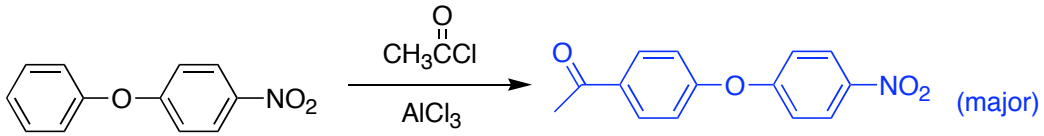



No reaction (too deactivated)

(c)

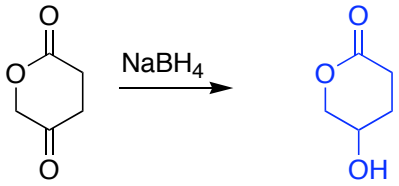



(d)

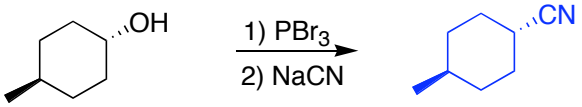



(major)

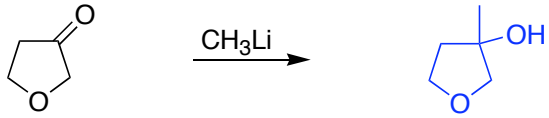
(e)



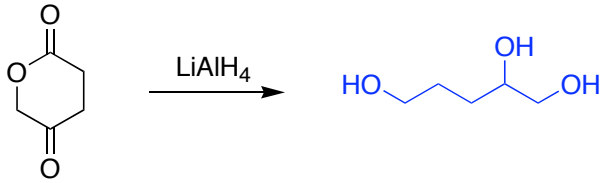

(f)



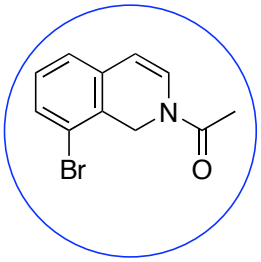

(g)

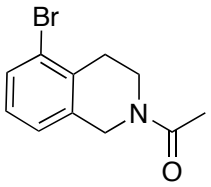



(h)



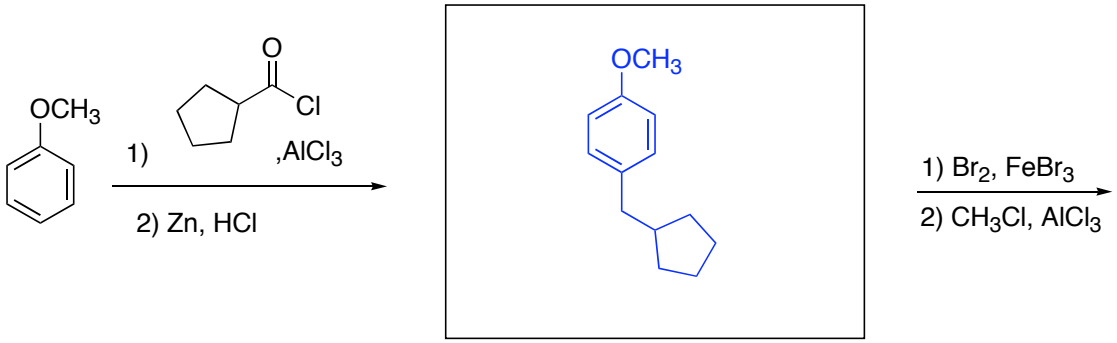
(2) Which of these two aromatic rings in more reactive toward nitration and why.

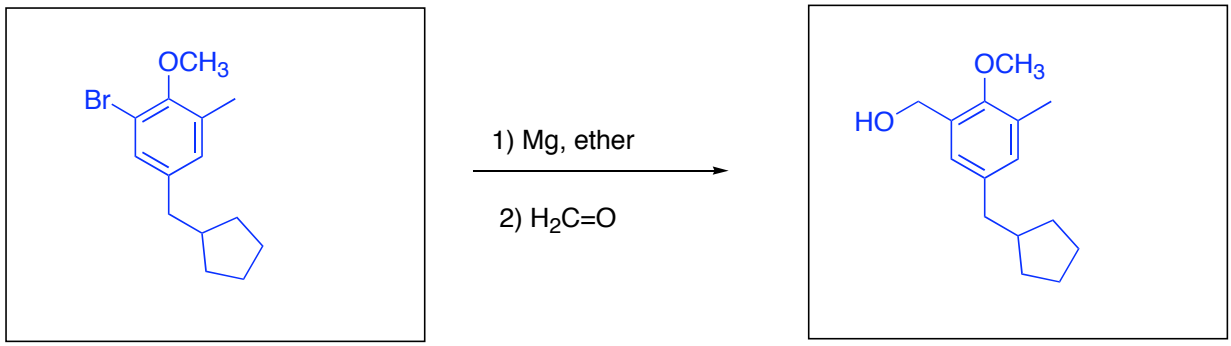


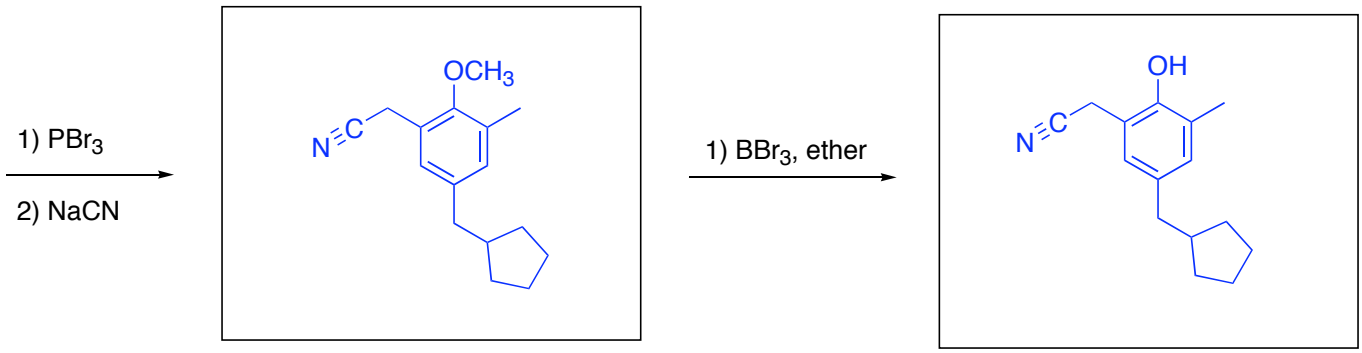




-the N lone pair is in conjugation with the ring, thus activating the system

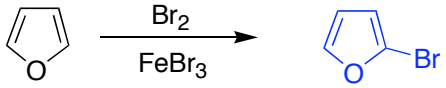
(3) Fill in the compounds in the following roadmap (only show the major product for each step)



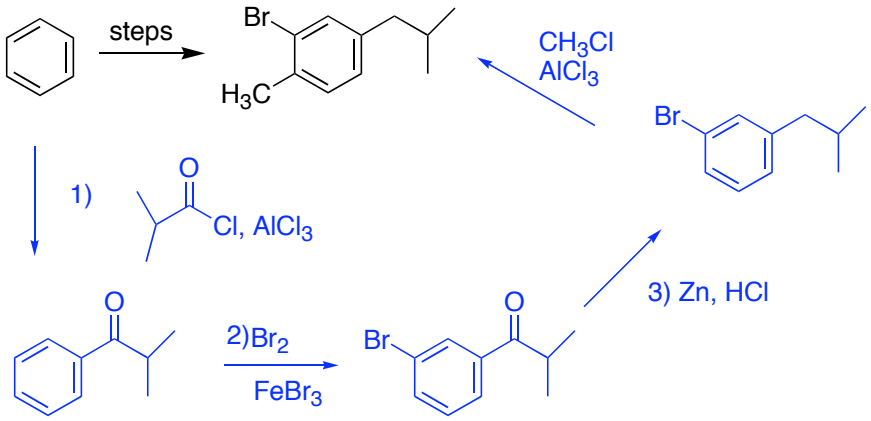
(4) The bromination of furan (below) can produce two different isomers. Draw the two possible products and indicate which is the major and explain your reasoning. (hint: consider the stability of the intermediatecations).




consider the two alternative intermediates...

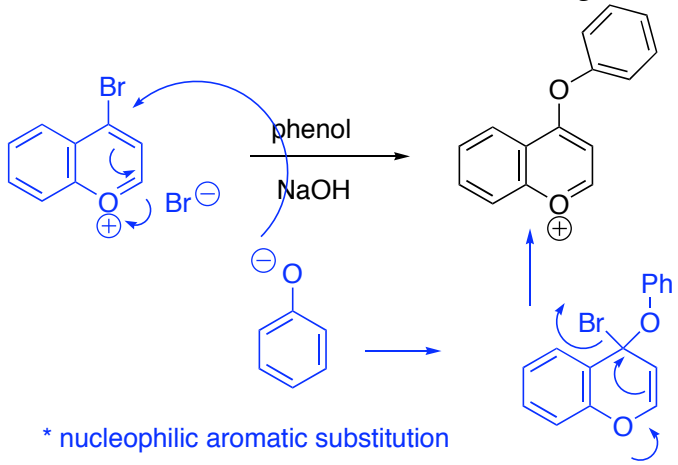

this cation is more stable because it 'has more resonance structures

(5) Using benzene as your starting material and any other reagents, synthesize the following molecule.




* other possible solutions

(6) Give a <u>detailed</u> mechanism for the following reaction

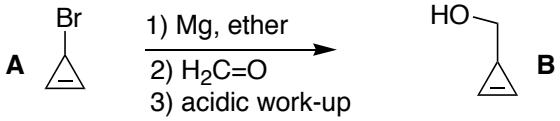



* nucleophilic aromatic substitution

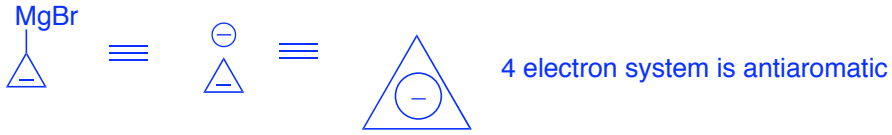
(7) Define "resonance stabilization energy" and give the value for benzene.

The difference in energy between a system where the pi-electrons are delocalized through resonance relative to the same system where the pi-electrons are localized. In benzne ~36 kcal/mol.

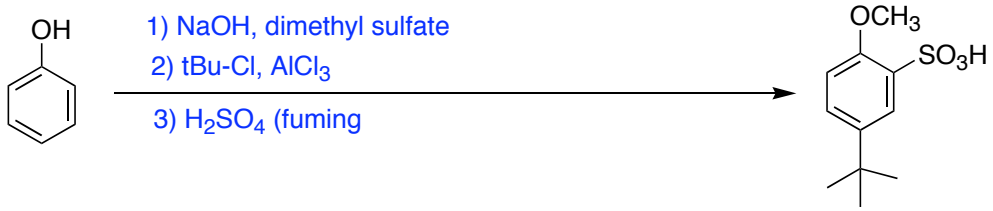
(8) A student wants to convert bromocyclopropene **A** to cyclopropenylmethanol **B** by forming the Grignard reagent and reacting it with formaldehyde**.** Is this a good idea and if not why?



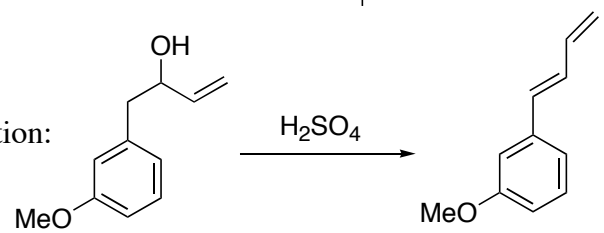

this is a poor choice because the intermediate ion is antiaromatic.




(9) List the reagents (in order) needed to accomplish the following transformation.




(10) A student was attempting the following reaction:




However, the product only shows 3 signals in the aromatic region of the NMR. What did the student really get and how did it happen?