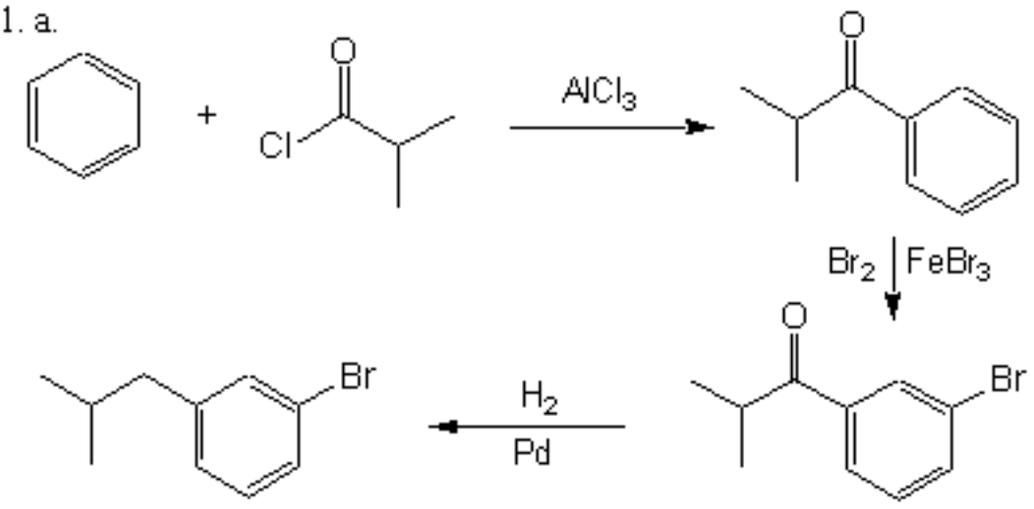
Organic Chemistry c3444y

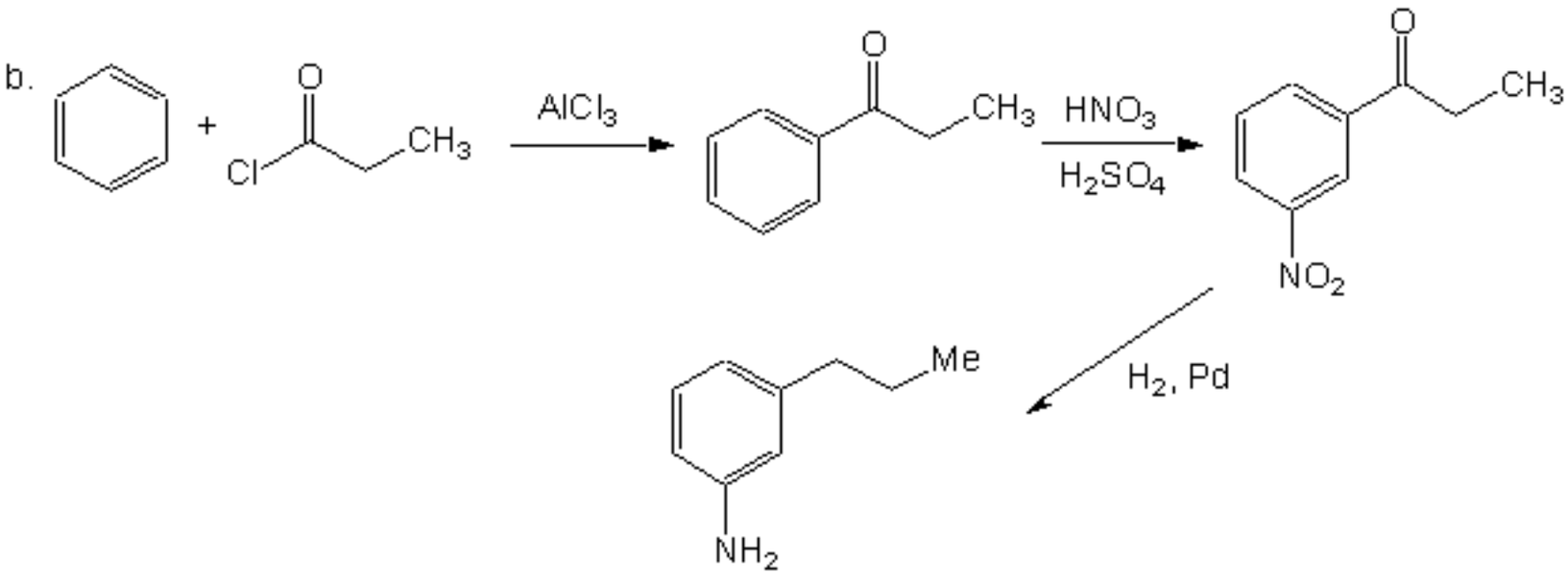
Problem Set 2 - Answer Key

1. a.

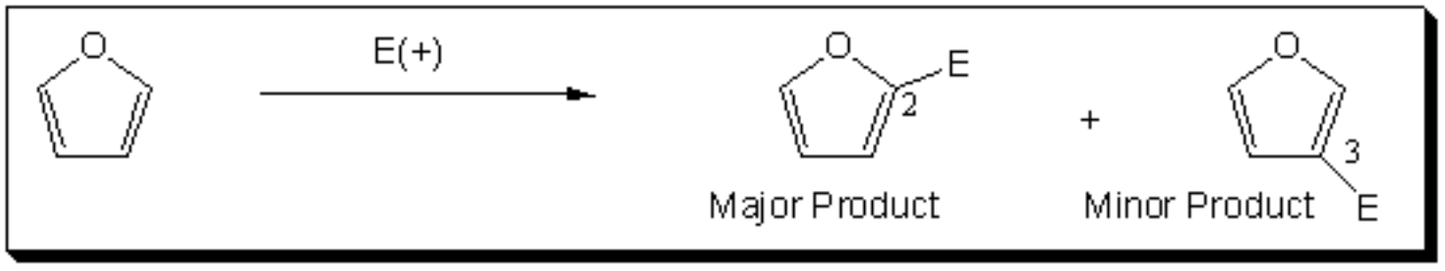


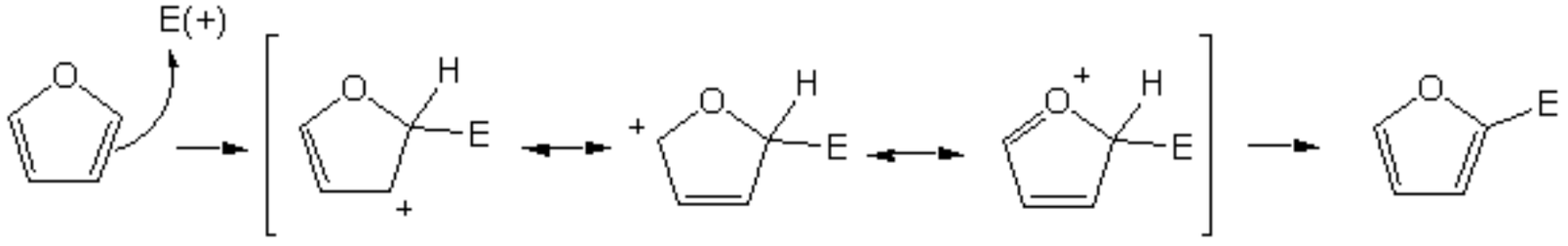
Analysis of the problem: *The target system has two* ortho/para *directors. There can be no two step synthesis, therefore. We also cannot put an* iso-*butyl group on directly. So we need a* meta *director that can be turned into an* iso-*butyl group.*

b.

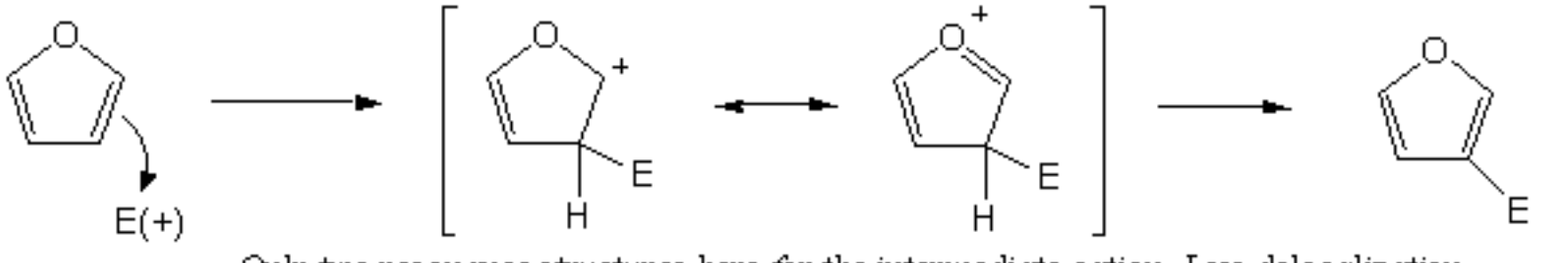


2.



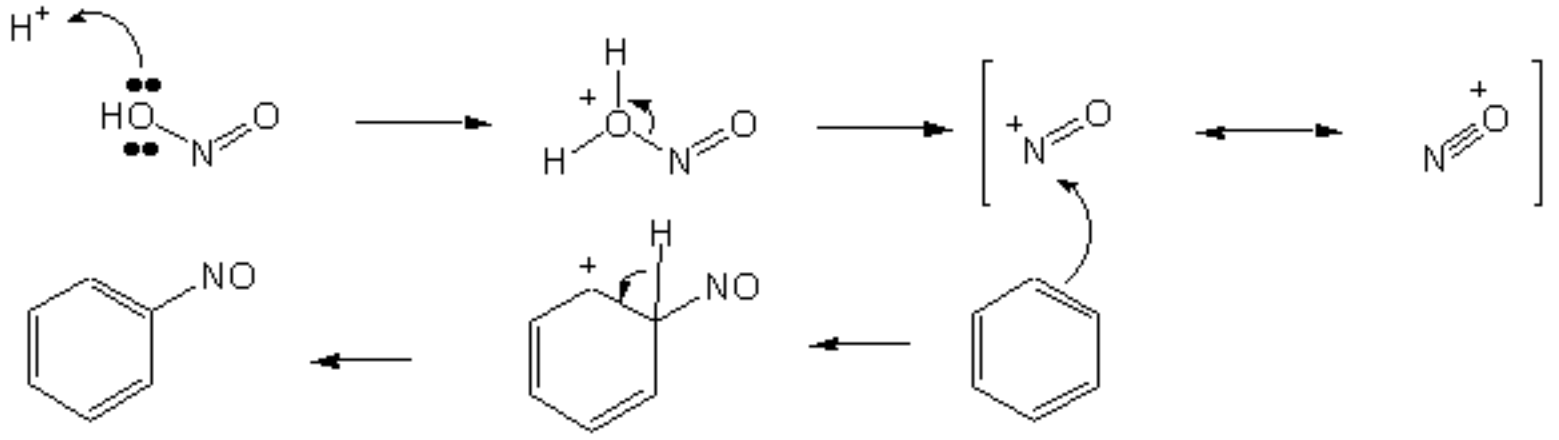


Three resonance structures here for the intermediate cation. More delocalization.



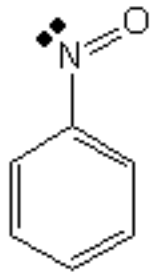
Only two resonance structures here for the intermediate cation. Less delocalization.

3. a.



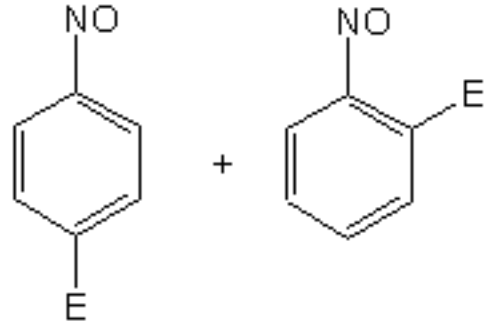
b.

We must begin by drawing a proper Lewis dot structure:

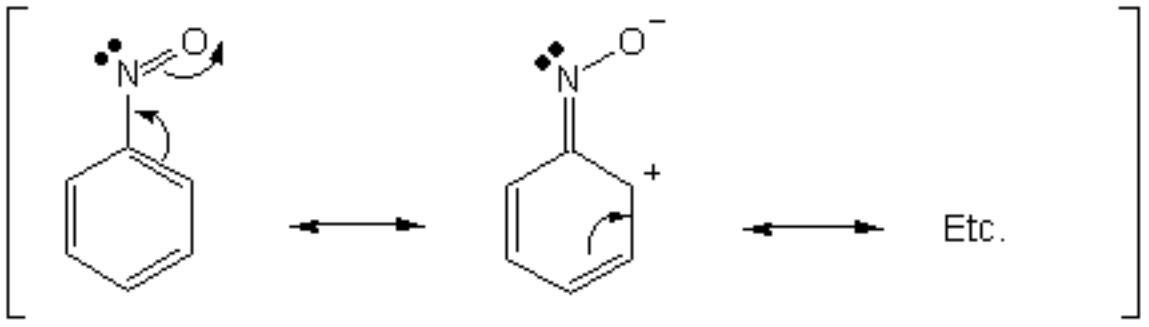


E(+)

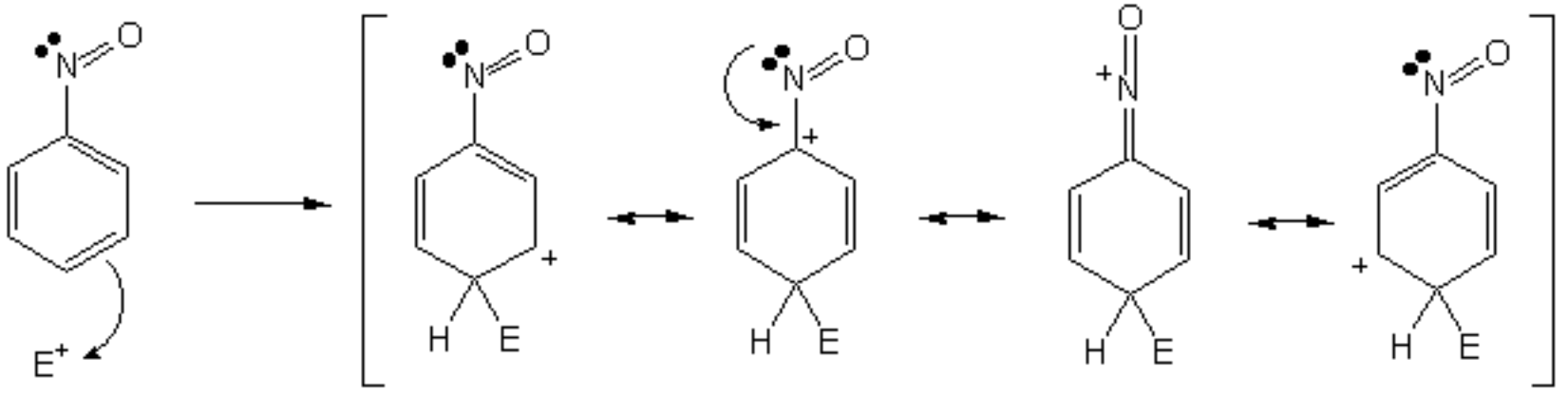
(Slower than benzene)



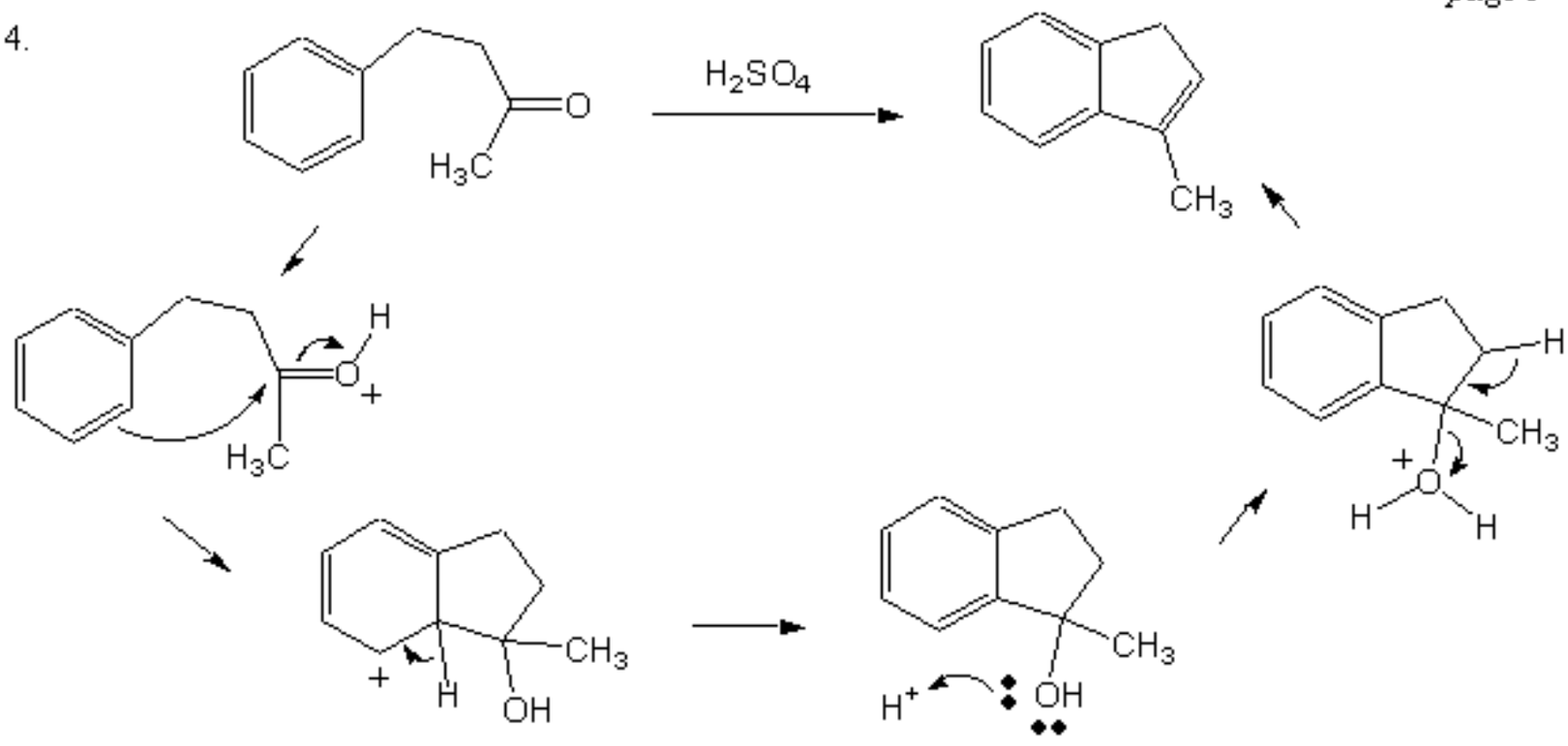
The NO group is a deactivator because it is an electron withdrawing group, just like a caboryl or a nitro, due to the electronegative oxygen atom:



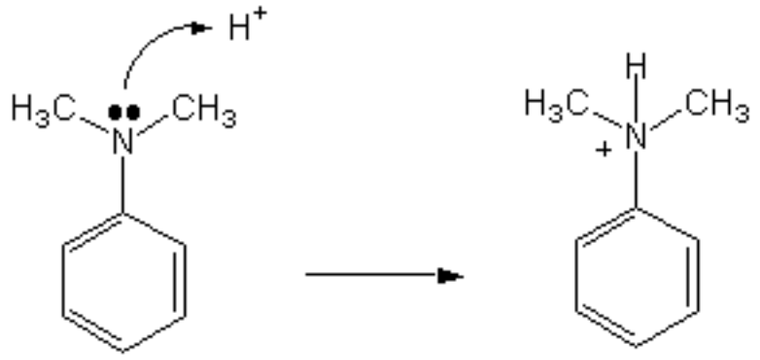
Like the halogens, however, if it is forced to react it will choose ortho/para to take advantage of the extra resonance structure that we can draw using the lone pair on the N:



4.

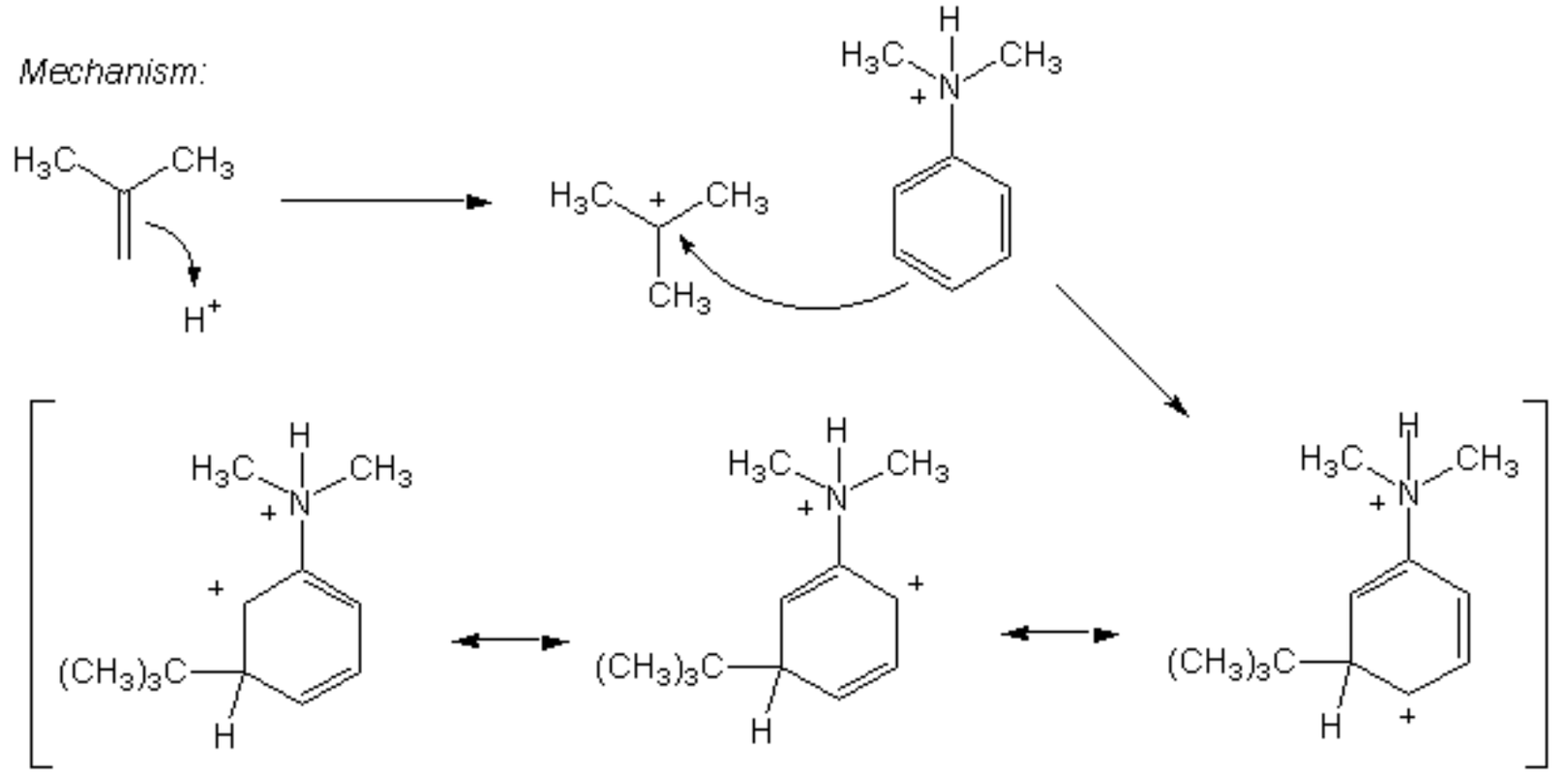


5. *The nitrogen of N,N-dimethylaniline is a basic nitrogen! Yes, the nitrogen is sp^2 and the lone pair is involved in resonance, but it is* not directly involved in the aromaticity. *Therefore, it is still basic, albeit weakly. But sulfuric acid is a very strong acid, so what will be the very first thing that will happen:*



Now, because of the positive charge, and the lack of a lone pair, this group is a deactivator and a meta director!

Mechanism:



Nothing special here, but if it went para (or ortho), one of the resonance structures would have 2 + charges on neighboring atoms. Thus, the arenium ion formed from meta attack is more stable than that derived from para (ortho) attack.