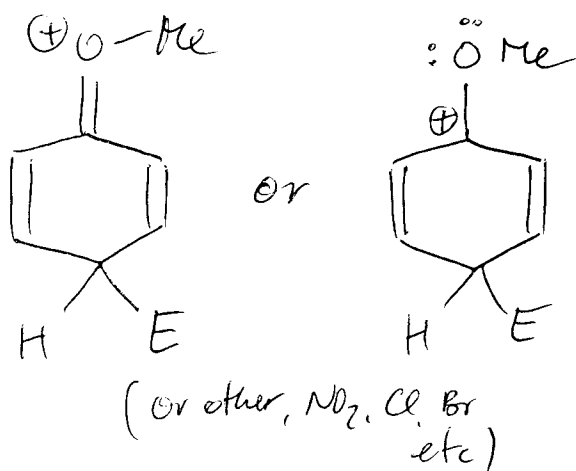


I. CONCEPTS AND THEORY

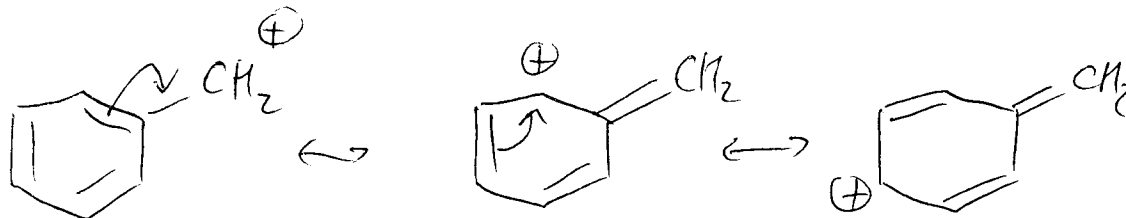
1. (25 points)

- a) (10 points) Show **one** key resonance structure that explains why the OMe group is ortho/para directing electrophilic aromatic substitutions, and **state why** in a few words:



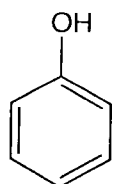
The lone pairs on the oxygen are donated to the ring, greatly stabilizing this intermediate.

- b) (10 points) Show key resonance structures that explain why the benzyl cation is highly stabilized:

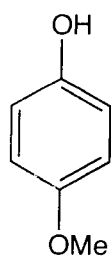


- c) (5 points) Predict the trend in acidity for the following substituted phenols. Rank by *increasing* acidity and explain the origin of this difference:

Trend: B < A < D < C

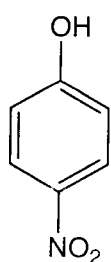


A



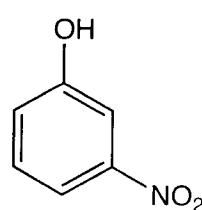
B

least



C

most



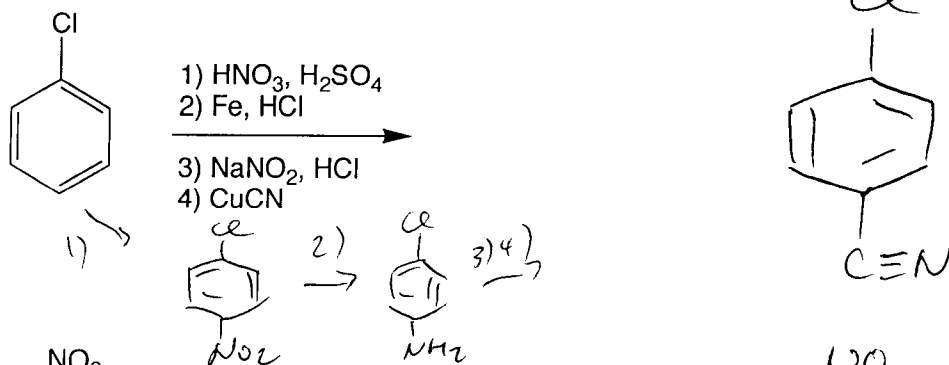
D

(~~more~~ than phenol)

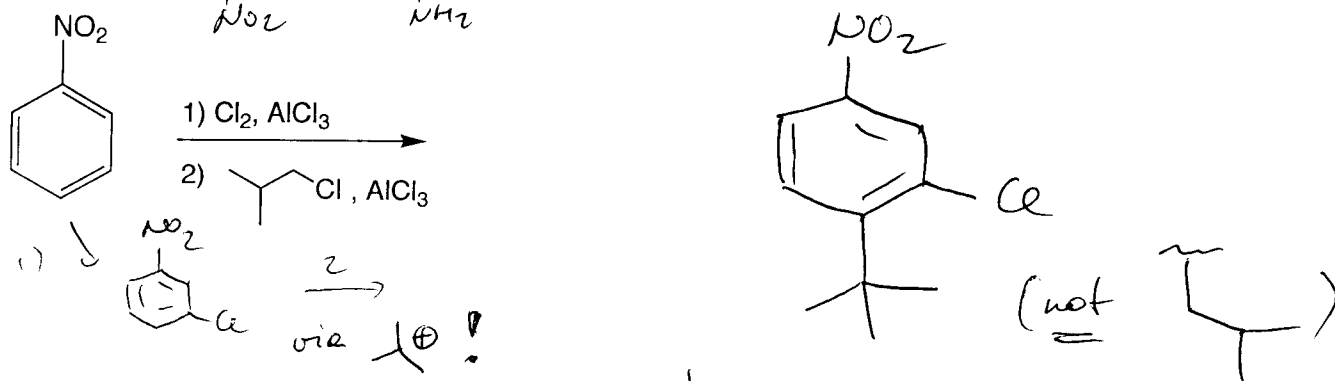
II. REACTIONS

2. (25 points) Give the product(s) for the following reactions, assuming **1 equivalent** of reagent is used unless specified otherwise (show each step, where applicable, to ensure max. credit if you are not sure of your final product):

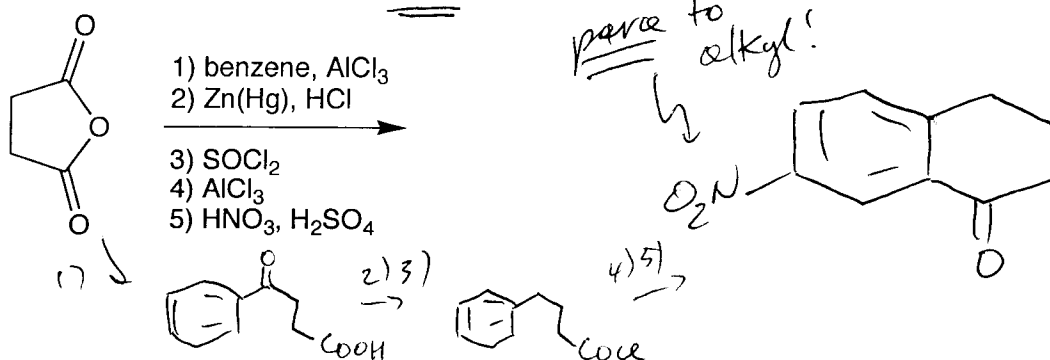
a)



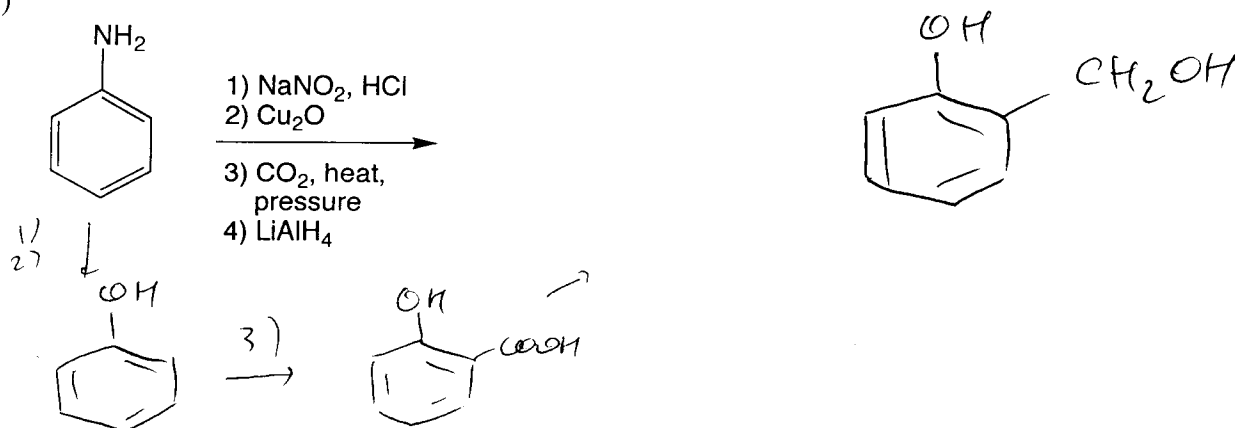
b)



c)



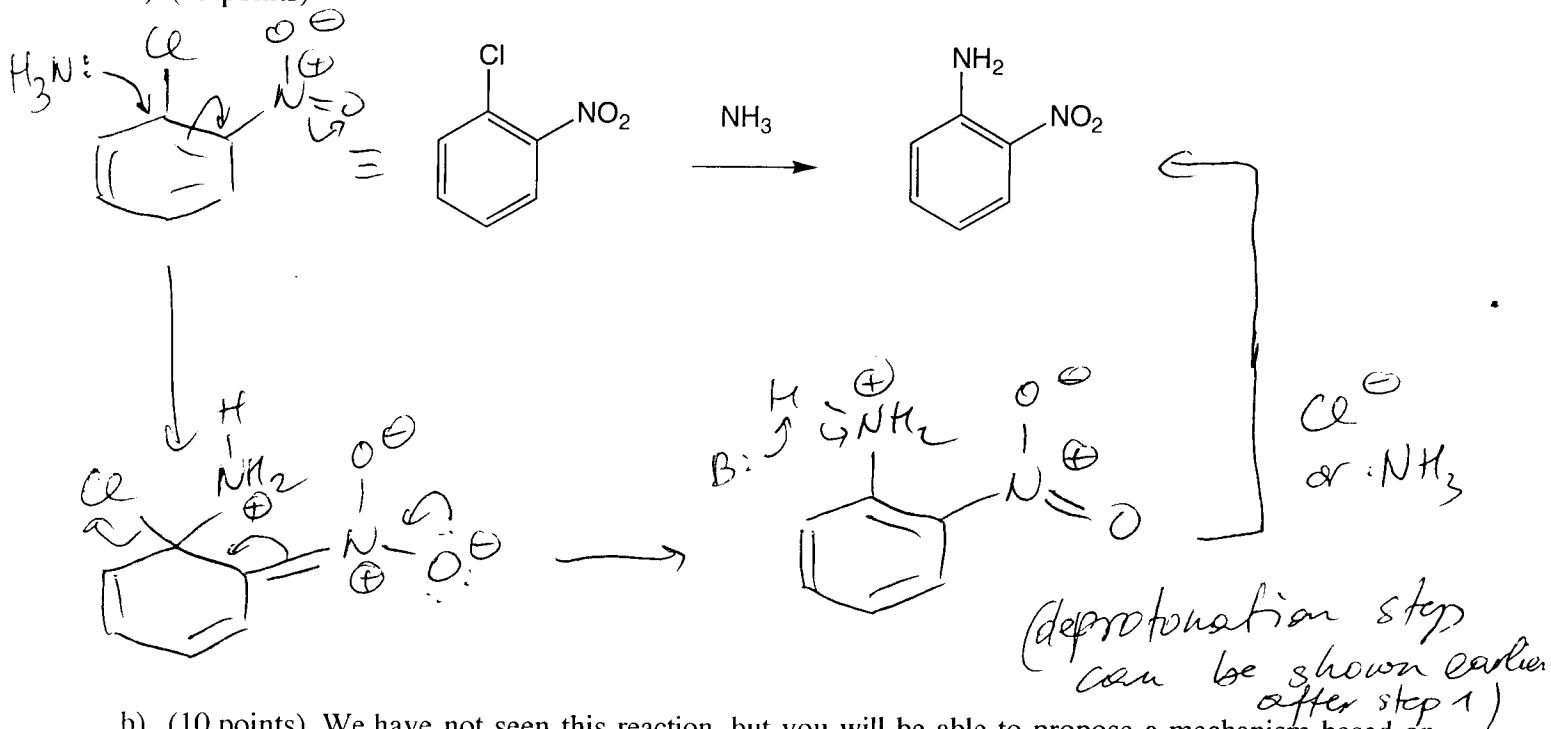
d)



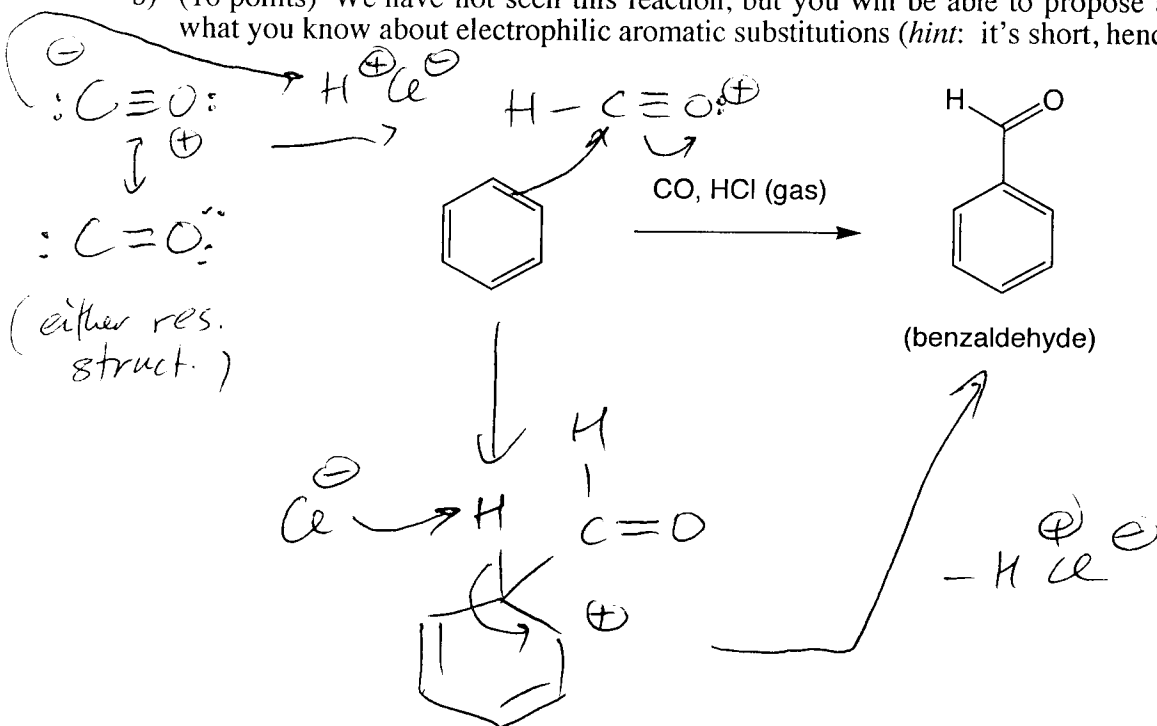
III. MECHANISMS

3. (25 points) Provide a complete, detailed mechanism with curved arrow formalism for the following reactions. **Each step must be explicitly written down**, i.e. every attack of reagent, bond breaking and bond forming steps must be shown!

a) (15 points)



b) (10 points) We have not seen this reaction, but you will be able to propose a mechanism based on what you know about electrophilic aromatic substitutions (*hint: it's short, hence the little space*):

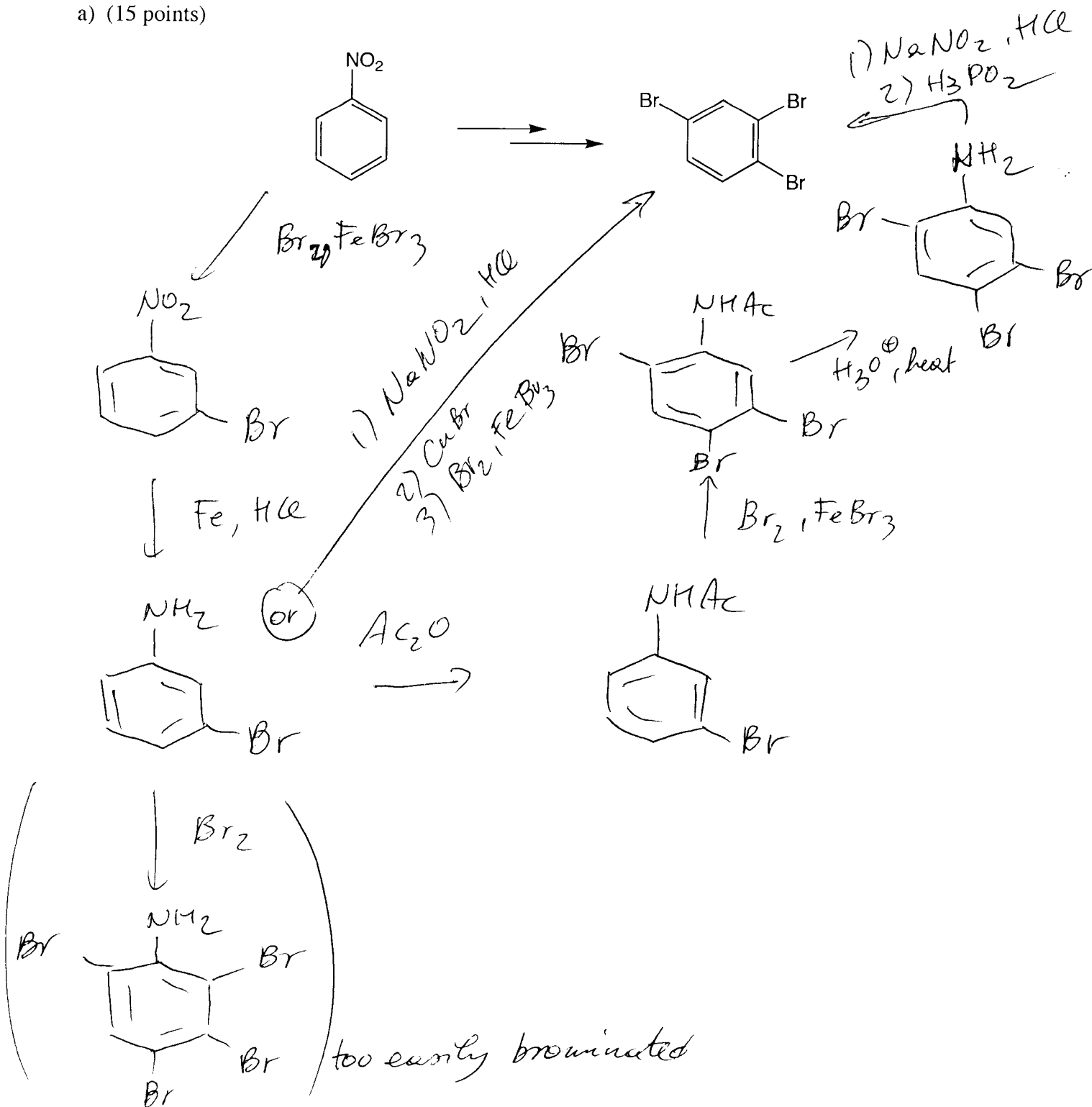


IV. TRANSFORM

4. (25 points) Devise a reasonable synthesis for each of the following compounds from reagents you are familiar with and the starting materials provided:

Note: do no "invent" new reagents or reactions. Use only those specifically taught in class or previous quarter's reactions. There should not be more than 10 steps necessary in these syntheses, although longer ones may also be correct.

a) (15 points)



5. b) (10 points)

