

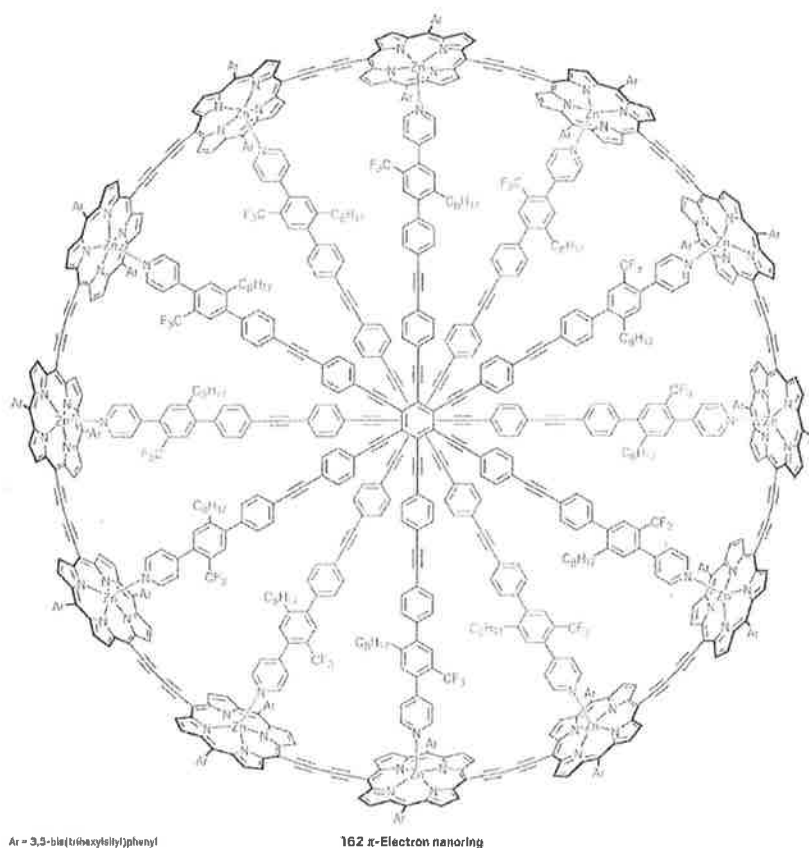
Chemistry 110B

FIRST EXAM

February 7, 2020

Name (print) KEY

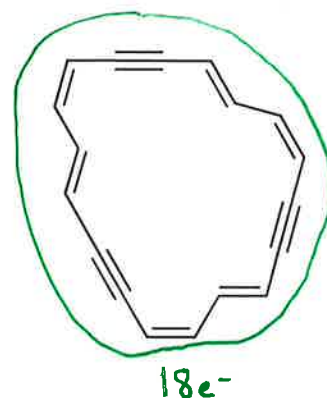
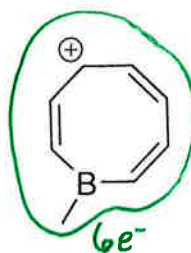
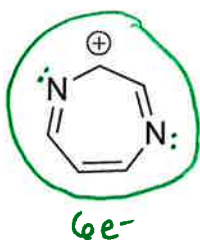
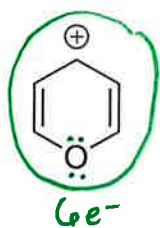
Note: Your exam should consist of 5 pages including this cover sheet. There is a bonus question on page 5.



This huge molecular wheel has set a new record as the largest _____ ring. *Nature Chemistry* **2020**, DOI: 10.1038/s41557-019-0398-3. The outermost ring in this record-setter has a 162 π electron count. The previous record-holder: 62 π electrons.

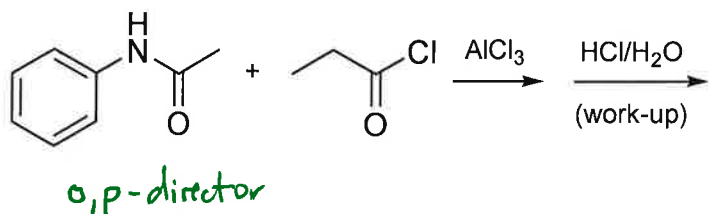
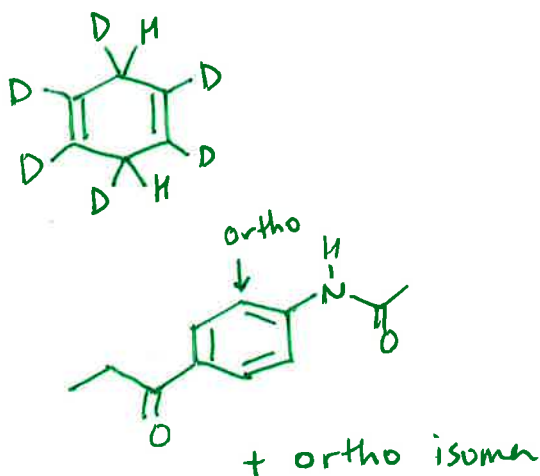
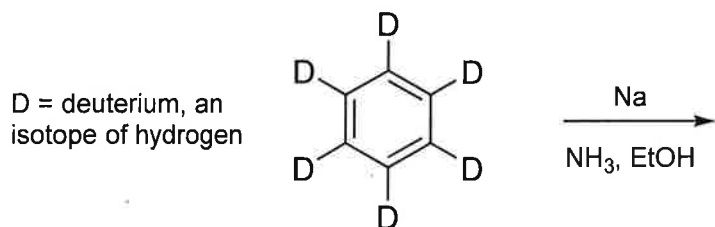
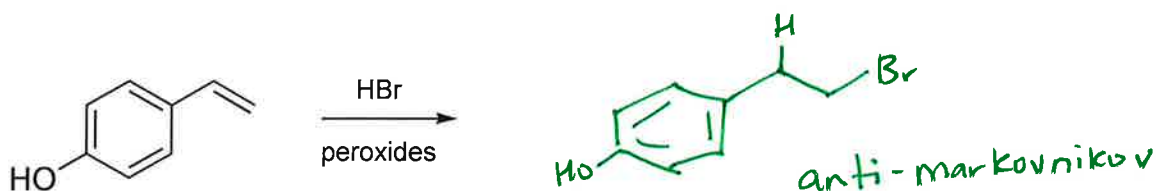
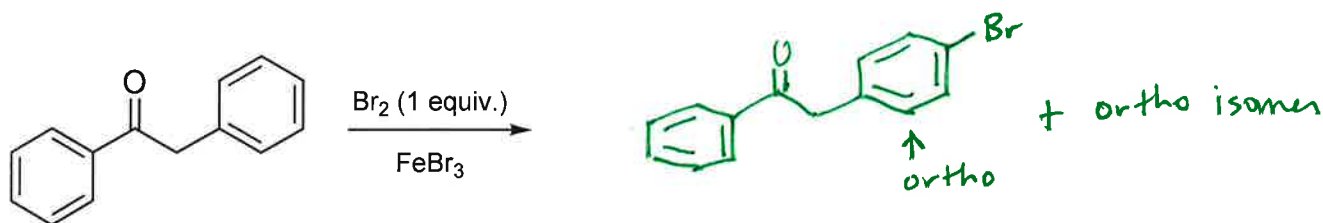
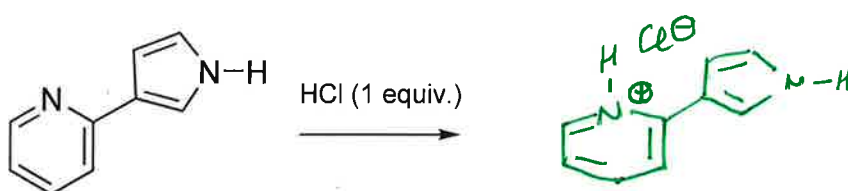
DO NOT OPEN THIS EXAM UNTIL INSTRUCTED TO DO SO

1a. Provide for each a count of the relevant electrons and circle the aromatic systems. 12 pts. *2 pts Ea*

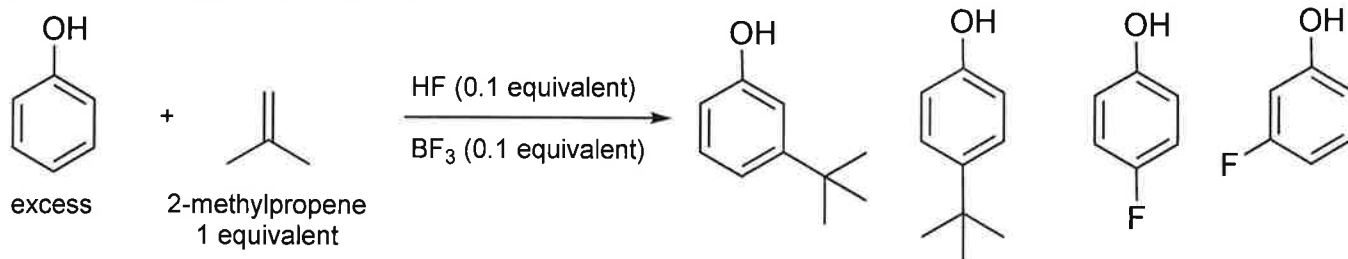


1b. When NADH loses H^- to form NAD^+ , the driving force for this reaction is conversion of an antiaromatic molecule into an aromatic molecule. **TRUE** / **FALSE** Circle your answer. 4 pts

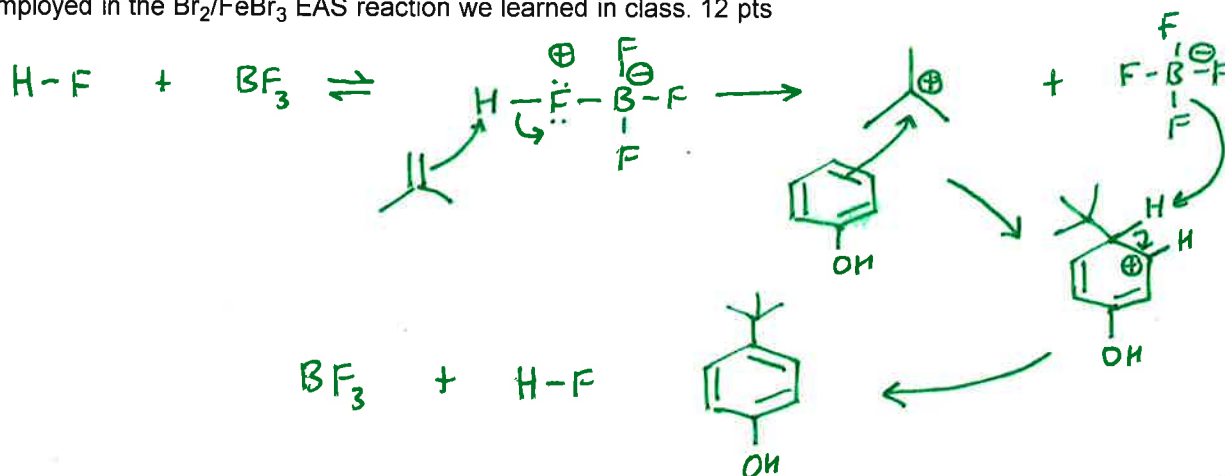
2. Predict the major product of each of the following reactions. Write "NR" if no reaction is expected. 20 pts *4 pts each*



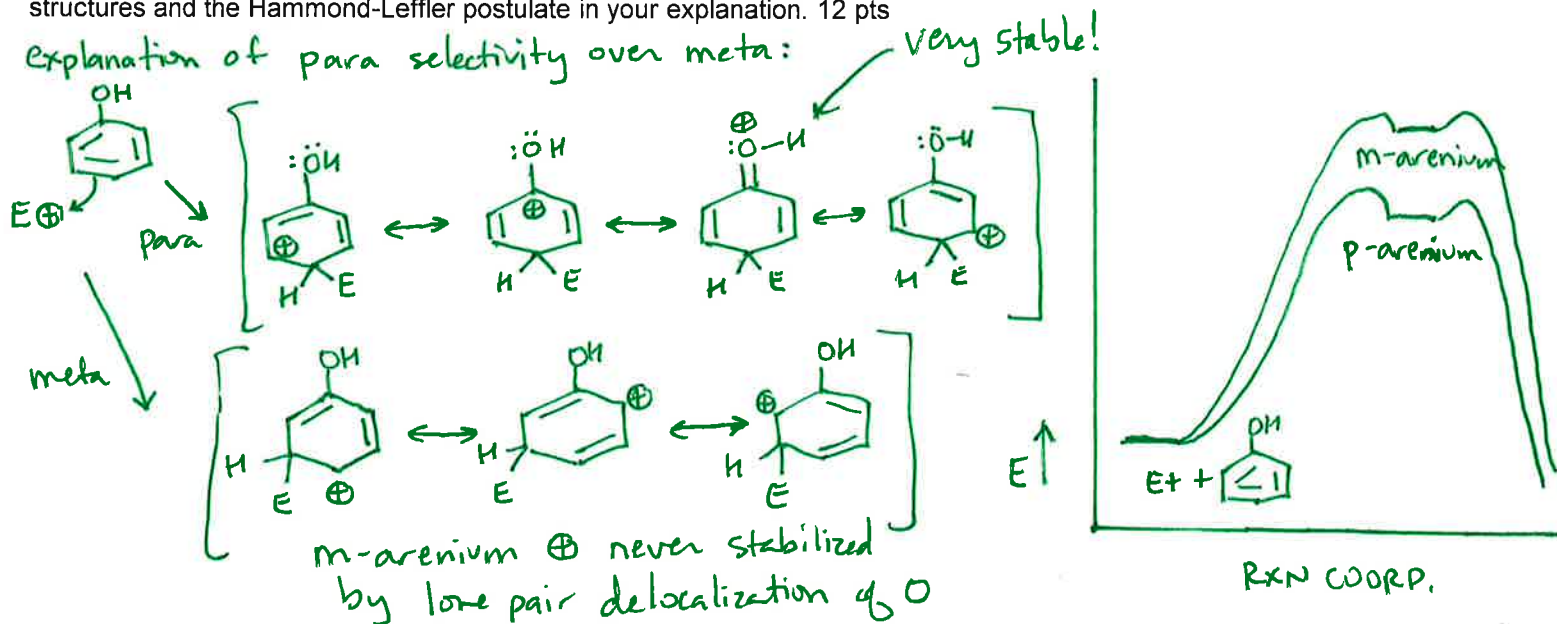
3a. Which electrophilic aromatic substitution product is formed when 2-methylpropene is added to a large excess of phenol containing HF and BF₃? (circle your answer) 6 pts



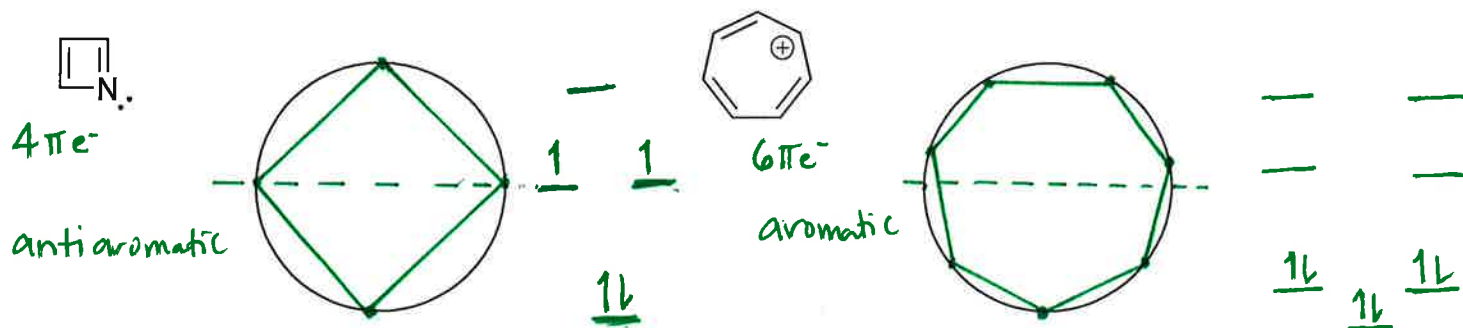
3b. Write a mechanism to explain the formation of the product you circled. Hint: **Begin** this mechanism in a manner similar to that employed in the Br₂/FeBr₃ EAS reaction we learned in class. 12 pts



3c. Now explain the origin of the *o,m,p* selectivity you are proposing in your answer to 3a. Employ a number of resonance structures and the Hammond-Leffler postulate in your explanation. 12 pts



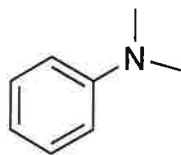
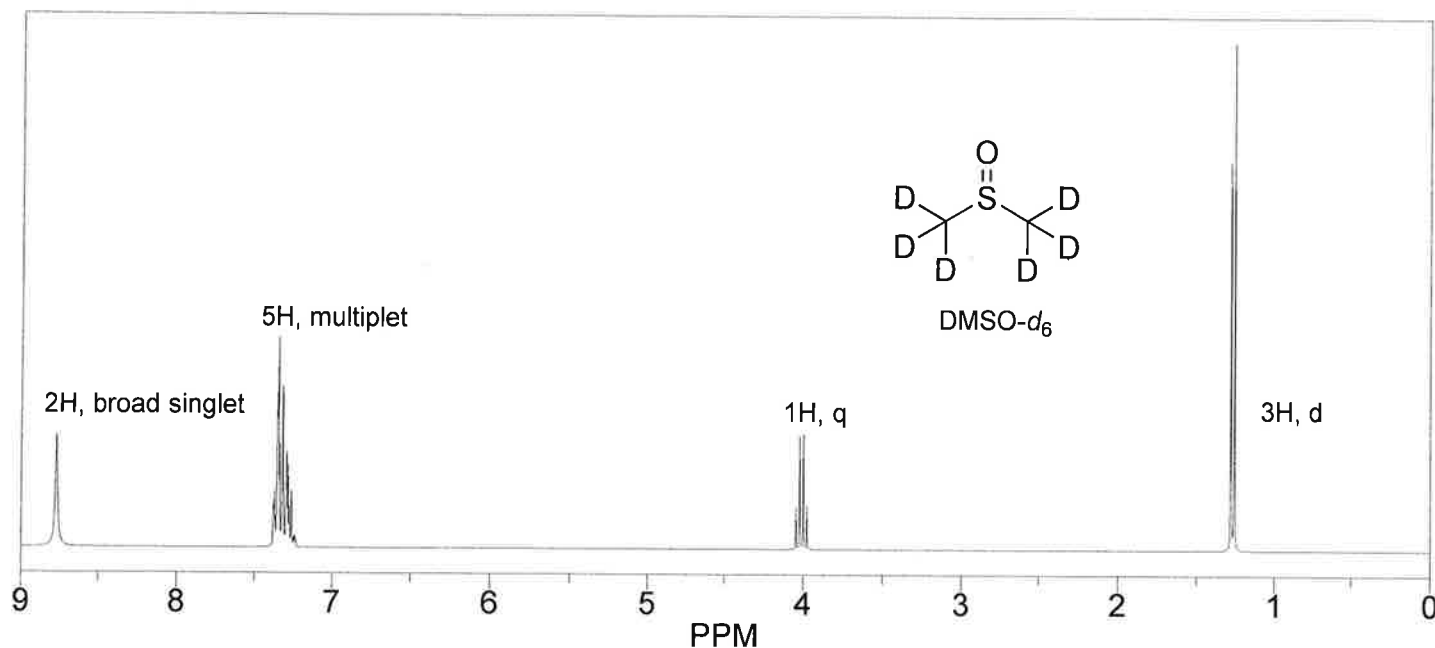
4. Using Hückel's rule and a magic circle analysis, characterize these systems as aromatic or antiaromatic. 12 pts



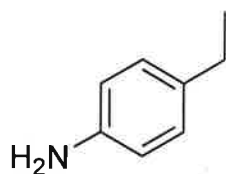
5a.

4

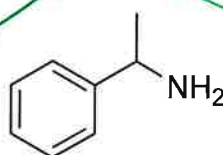
5. Circle the structure that is consistent with the ^1H NMR spectrum, recorded in $\text{DMSO}-d_6$ solvent. 6 pts



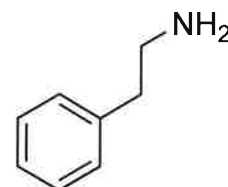
Chemical Formula: $\text{C}_8\text{H}_{11}\text{N}$
Exact Mass: 121.09



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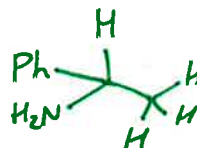
5b

5a. With a few words and a fragment of the structure you circled in 5a, interpret the pattern at 4 ppm. 6 pts

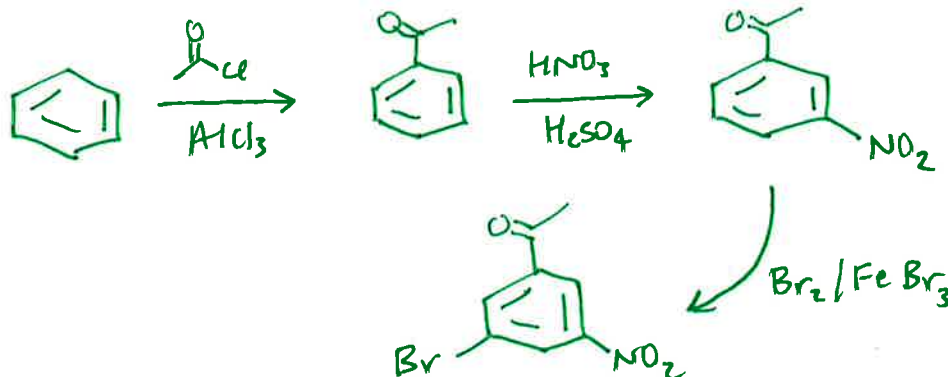
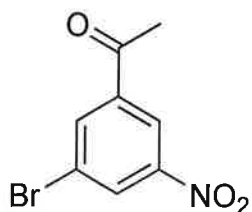
pattern @ 4ppm is a quartet 1:3:3:1

1H is coupling to 3H of methyl

$n+1$ rule



6. Propose a synthesis of this compound, starting with benzene and using any necessary reagents. 10 pts



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Page	Points	Score
2	36	
3	42	
4	22	
bonus	2	
Total	100	

Bonus: Complete the sentence on the cover page of this exam.