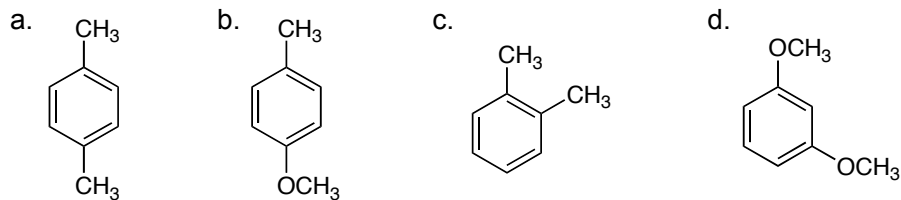
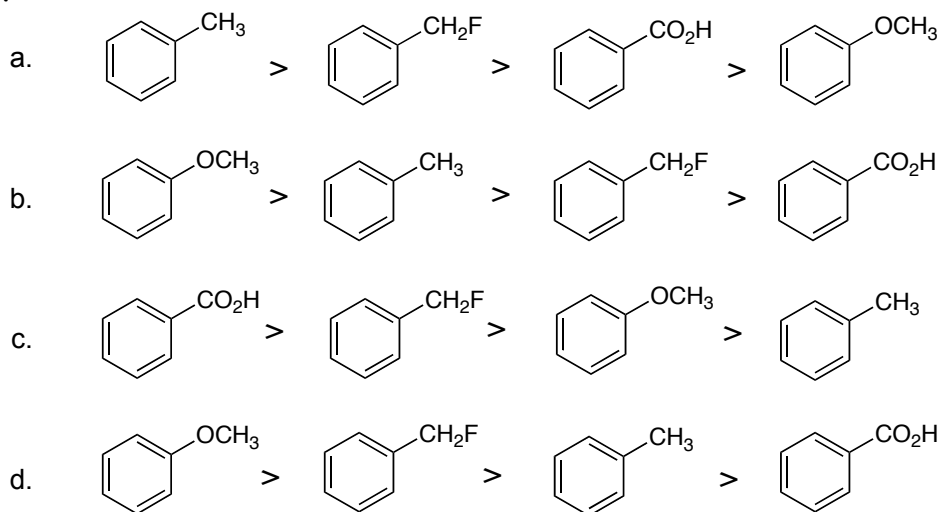


Multiple choice: Select the best answer for the follow questions. (10 questions, 30 points)

1. Select the structure that is consistent with the following ^{13}C NMR data:
 $\delta = 137, 129, 125, 18$



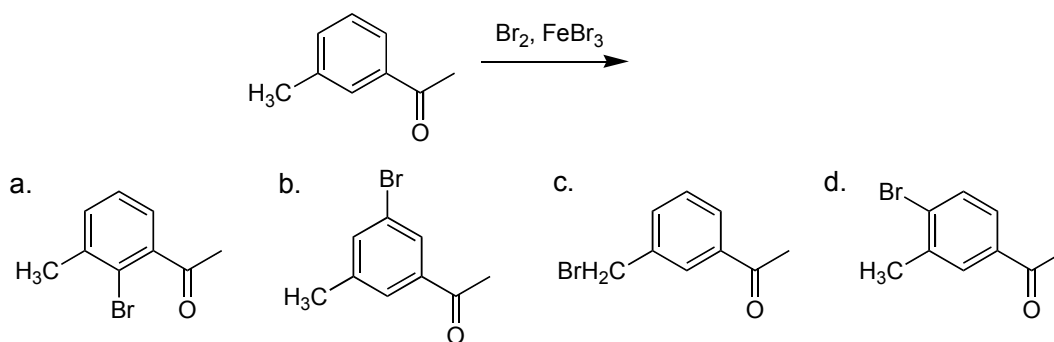
2. Which is the correct order of reactivity (most reactive to least reactive) toward electrophilic aromatic substitution?



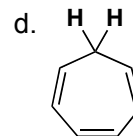
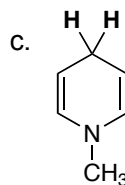
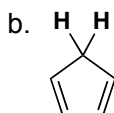
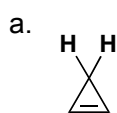
3. Which of the following is the weakest acid?

- a. phenol
 b. 3,4-dimethylphenol
 c. *m*-chlorophenol
 d. *p*-nitrophenol

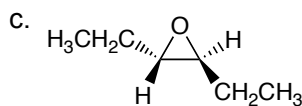
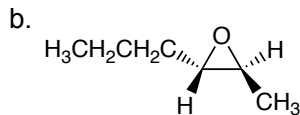
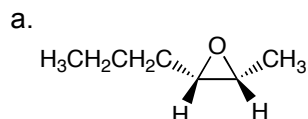
4. Which is expected to be the major product for the following reaction:



5. Consider the highlighted protons. Which compound is predicted to have the lowest pK_a ?

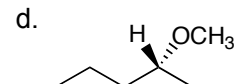
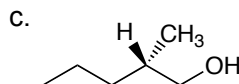
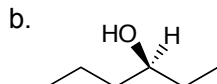
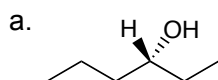
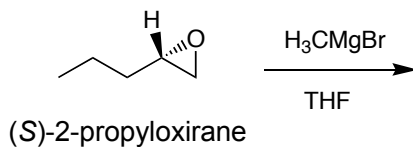


6. Which of the following will be the product from the reaction of (*E*)-2-hexene with *m*-chloroperbenzoic acid?



d. a, b and c are all products of the reaction

7. Predict the major product from the following reaction.



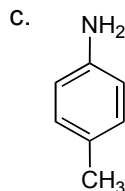
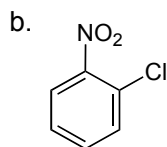
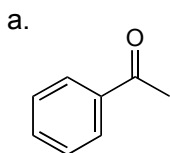
8. Which of the following can be used to convert benzyl alcohol to benzoic acid?

- LiAlH_4 , ether
- CrO_3 , H_3O^+ (Jones' Reagent)
- pyridinium chlorochromate (PCC), CH_2Cl_2
- $\text{Hg}(\text{O}_2\text{CCH}_3)_2$

9. Which of the following reagents will react with (*S*)-3-methyl-3-octanol to give an optically active product.

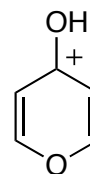
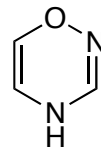
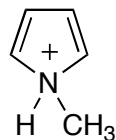
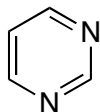
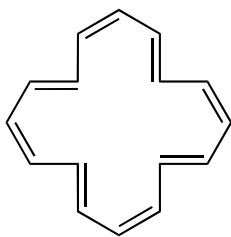
- POCl_3 , pyridine
- HBr
- NaH , THF, CH_3I
- all of the above

10. Which of the following is compatible with a Friedel-Crafts reaction.



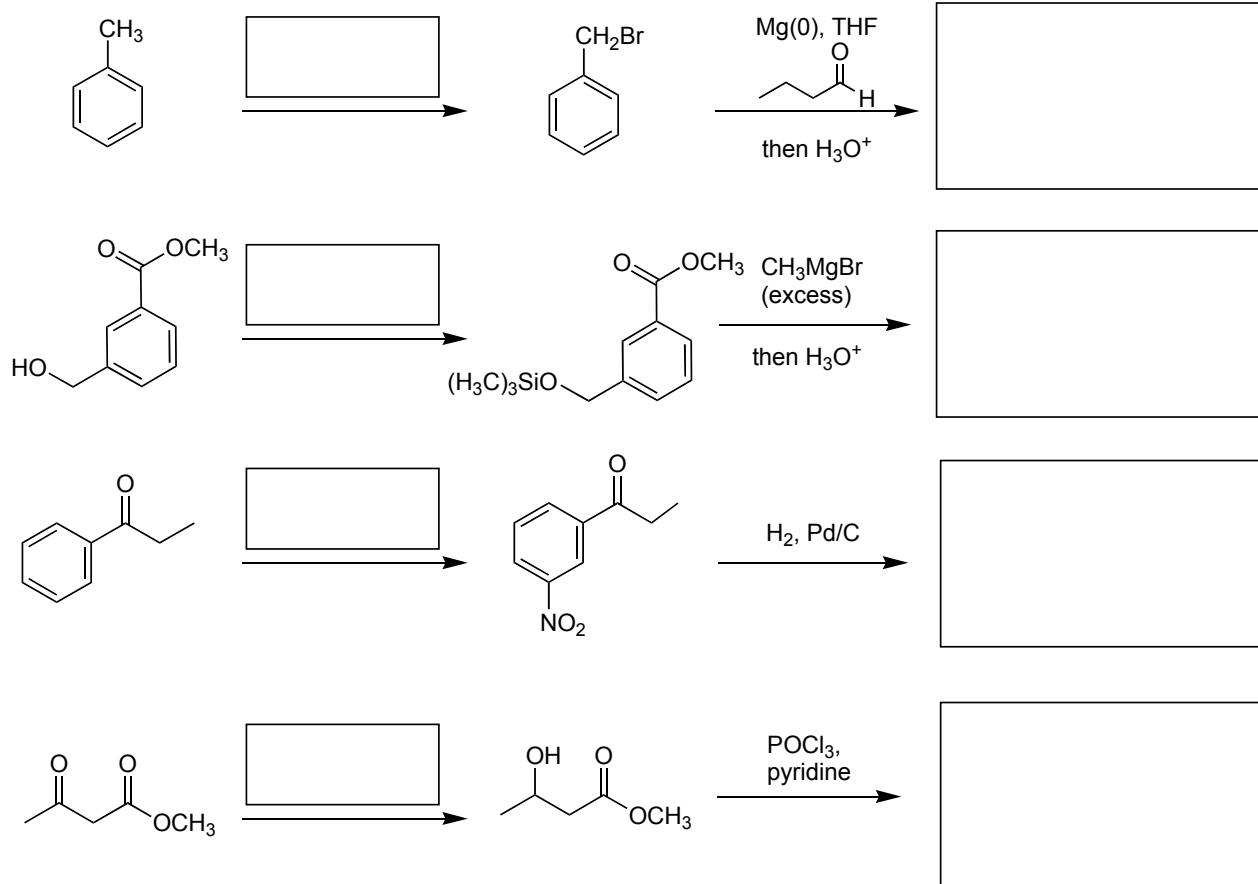
d. None; a, b, and c are all incompatible with the Friedel-Crafts reaction

11. Describe the following as aromatic, anti-aromatic or non-aromatic (neither aromatic nor anti-aromatic). Assume each is planar. (10 points)

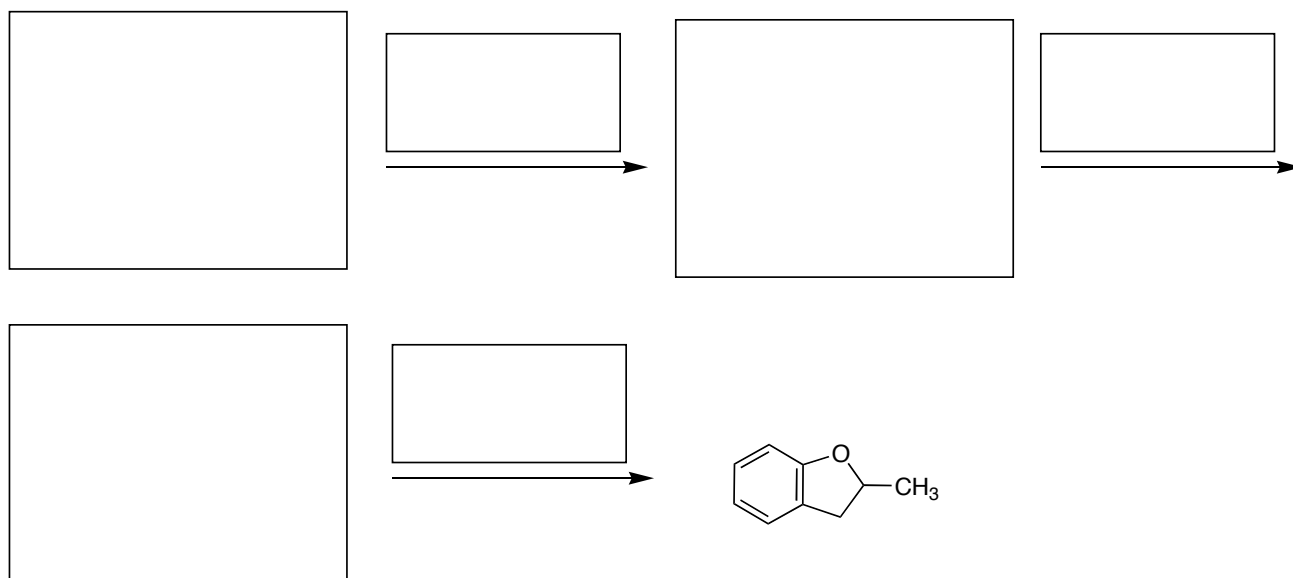


12. Explain why *p*-nitrophenol is much more acidic than a normal alcohol. Your answer should include a mechanism that is consistent with the increased acidity. Be brief; a picture is worth a thousand words. (12 pts)

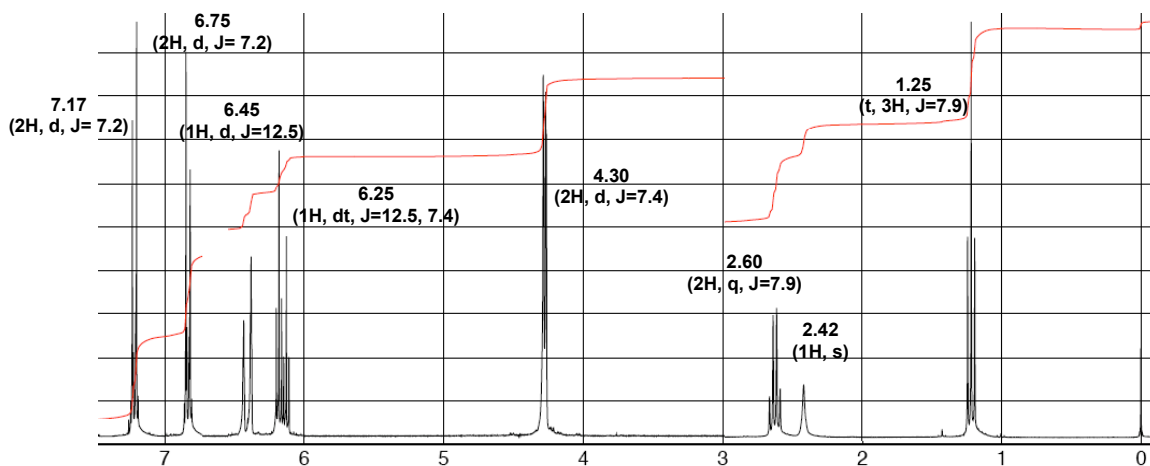
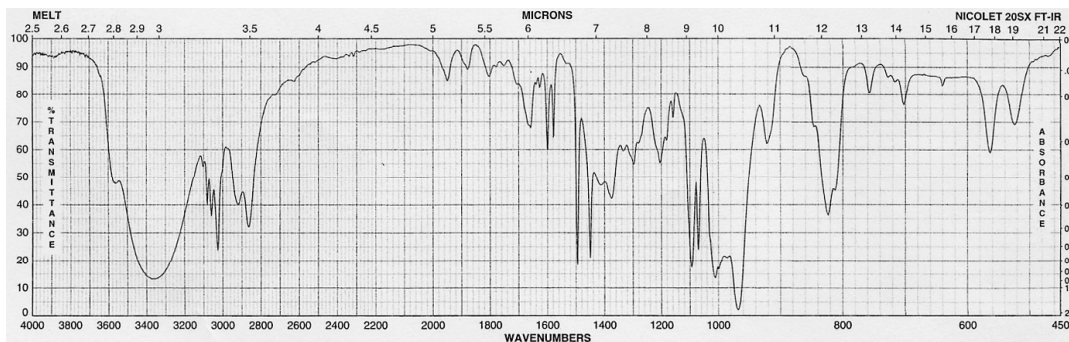
13. Provide the necessary reagents and give the products for the following reactions: (24 pts)



14. Complete the following synthesis. You may start with any mono-substituted benzene and use any alkyl halide, any acid chloride and any other necessary reagents. For full credit, complete the synthesis in the number of steps shown, while minimizing the number of reactions that give mixtures of products. (12 pts)



15. Provide a structure that is consistent with the following data. Please show your reasoning. (12 pts)
Formula: $C_{11}H_{14}O$



^{13}C NMR: 140, 132, 128, 125, 122, 119, 65, 32, 14

Problem	1-10: _____ (30 pts)	13: _____ (24 pts)
	11: _____ (10 pts)	14: _____ (12 pts)
	12: _____ (12 pts)	15: _____ (12 pts)

Total out of 100: _____