CHEM 3331 (Richardson) Midterm Exam 2 – Oct. 18, 2022

Your Name: _____

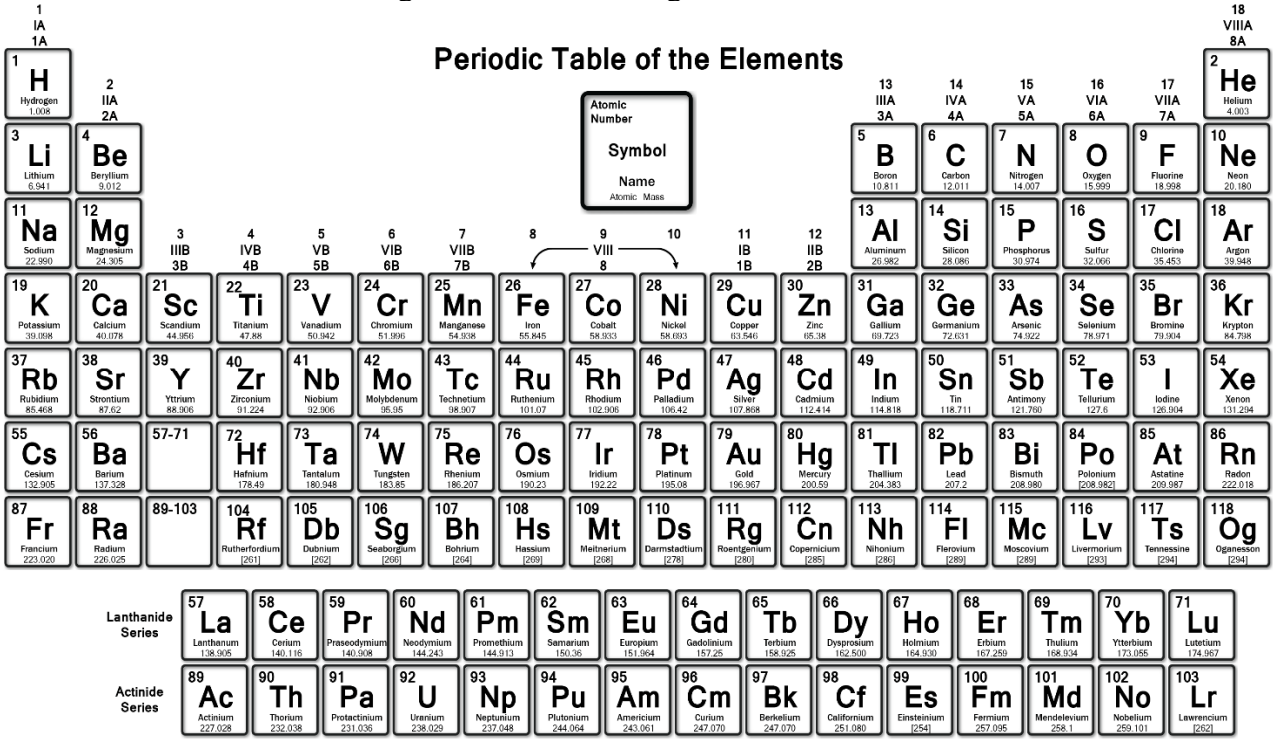
Student ID: _____

Recitation (fill in one circle):

O 134 (Wed 12:20 w/ Will)
O 135 (Wed 1:25 w/ Will)
O 136 (Wed 2:30 w/ Will)
O 137 (Wed 3:35 w/ Will)
O 142 (Thu 10:10 w/ Ethan)
O 143 (Thu 11:15 w/ Ethan)
O 144 (Thu 12:20 w/ Ethan)
O 147 (Thu 3:35 w/ Hongxuan)

Question	Score	Out of
1		25
2		30
3		30
4		15
5		10 e.c.
Total		100

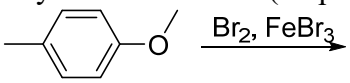
This is a closed-book exam. The use of notes, calculators, or cell phones will not be allowed during the exam. You may use models sets brought in a clear bag. Use the backs of the pages for scratch work. If your final answer is not clearly specified, you will lose points. For mechanisms, show all intermediates including correct formal charges, but do not show transition states.



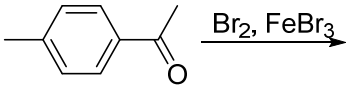
pKa Values

HI	-10	CH_3COOH	4.7	ArOH	10	HC≡CH	26
HBr	-8	HN_3	4.7	RSH	10-12	H_2	35
HCl	-6	H_2S	7.0	H_2O	15.7	NH_3	36
H_3O^+	-1.7	NH_4^+	9.3	ROH	16-18	$H_2C{=}CH_2$	45
HF	3.2	HCN	9.4	O=C-CH	9-25	CH_4	60

1) The directing effects of groups during electrophilic aromatic substitution reactions can be explained by resonance. (25 pts)
   a. The reaction below produces a single isomer as the major product. Show the mechanism for its formation, including all resonance forms for the intermediate. In thirty words or less, explain the regiochemistry of this reaction. (10 pts)

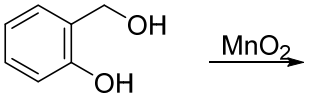


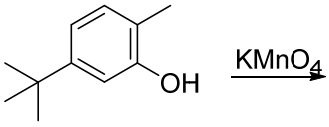
   b. The reaction below produces a single isomer as the major product. Show the mechanism for its formation, including all resonance forms for the intermediate. In thirty words or less, explain the regiochemistry of this reaction. (10 pts)

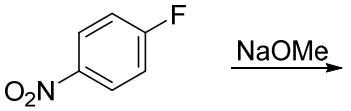


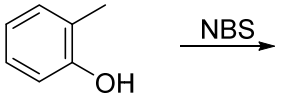
   c. Which reaction would be faster? Explain in under thirty words. (5 pts)

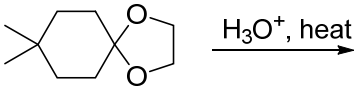
2) Predict the major product of the following reactions. If no reaction occurs, then write NR. Do not show stereochemistry. (30 pts; 3 pts each)

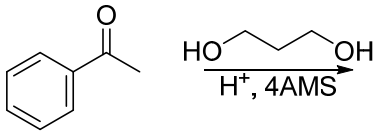
a. 

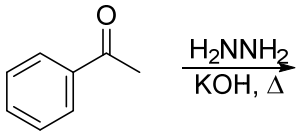
b. 

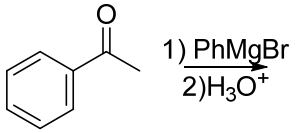
c. 

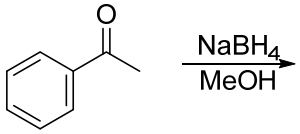
d. 

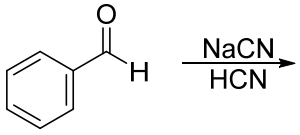
e. 

f 

g. 

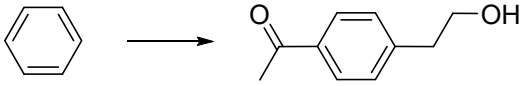
h. 

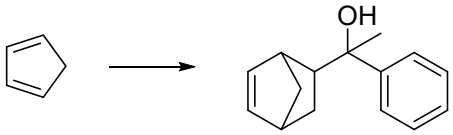
i. 

j. 

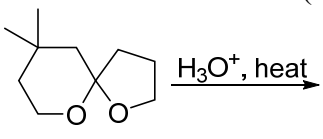
3) Find a way to synthesize the desired product from the given starting material. If more than one step is necessary, show the product of each step. Do not show mechanisms. (30 pts; 10 pts each)

a. 

b. 

c. 

4) Show the mechanism and product for the reaction below. (15 pts)



5) Extra credit! Show two ways this compound could be synthesized via a Friedel-Crafts reaction. Which of the two methods is likely to be a faster reaction? (10 pts e.c.)