CHEM 3331 (Richardson) Midterm Exam 2 – Oct. 24, 2023

Your Name: _____

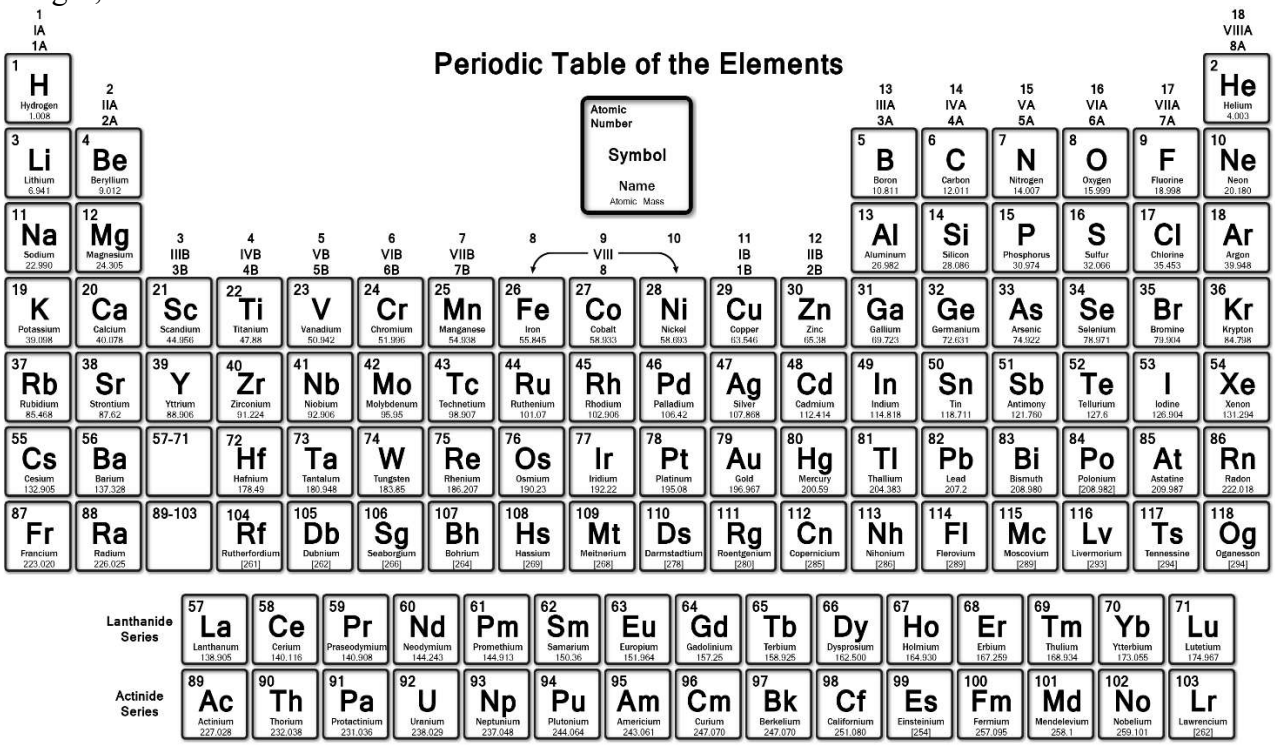
Student ID: _____

Recitation TA (fill in one circle):

O 134 (Alec Kolodziejczyk) O 142 (Kajal)
O 135 (Alec Kolodziejczyk) O 143 (Kajal)
O 136 (Lukas Gardner) O 144 (James Greenwood)
O 137 (Lukas Gardner) O 147 (Lukas Gardner)
O 141 (Kyle Fisch)

Question	Score	Out of
1		10
2		20
3		30
4		20
5		20
6		10 e.c.
Total		100

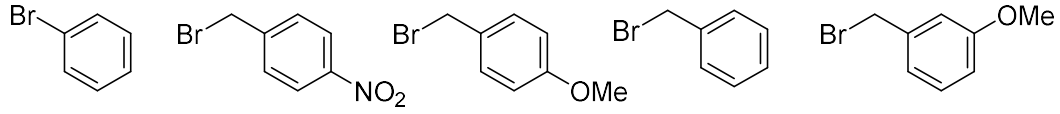
This is a closed-book exam, except for one double-sided sheet of 8.5 x 11" paper. The use of calculators or cell phones will not be allowed during the exam. You may use models sets brought in a clear bag. Use the backs of the pages for scratch work. If your final answer is not clearly specified, you will lose points. For mechanisms, show all intermediates including correct formal charges, but do not show transition states.



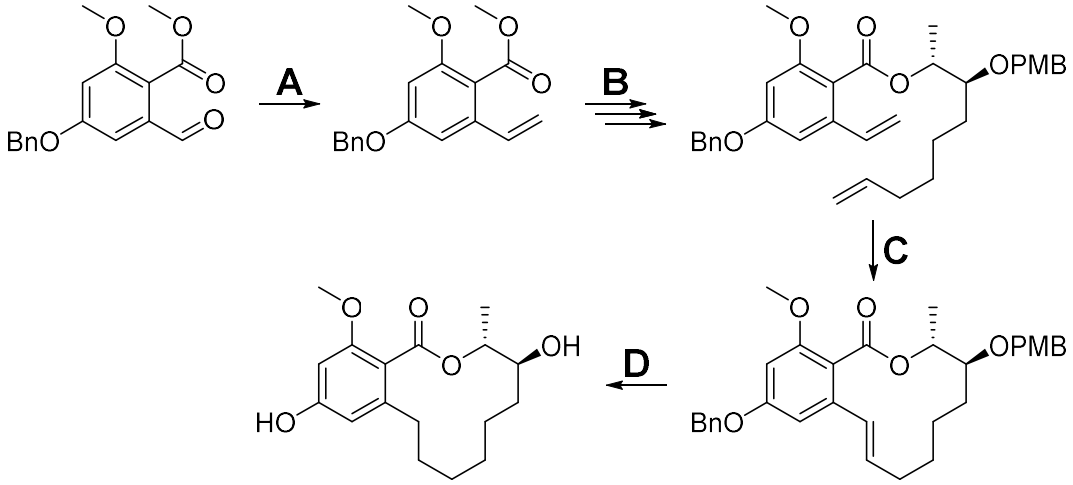
pKa Values

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) Arrange each of the following groups of compounds in order of decreasing reactivity (1 = fastest, 5 = slowest) when performing an S_N1 reaction with NaOMe. (10 pts)



2) Lasiodiplodins are a family of compounds produced by fungi that show many useful properties, including antimicrobial activity. A new total synthesis of one of these, (3R, 4S)-4-hydroxylasiodiplodin, was recently published and is summarized below. (20 pts)



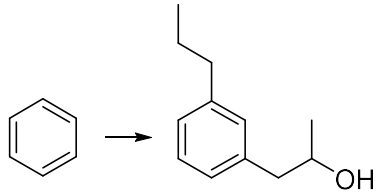
a. What reaction is happening in step **A**? What reagent(s) are used for this step? (5 pts)

b. What reaction is happening in step **C**? What reagent(s) are used for this step? (No need to draw the actual structure!) (5 pts)

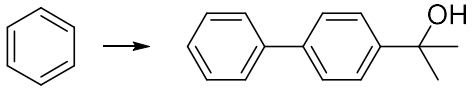
c. What reaction is happening to the large ring of the molecule step **D**? What reagent(s) are used for this step? (5 pts)

d. You might have noticed that there are a few groups that start out as "-OPMB" or "BnO-" in the molecule that later become OH groups during step **D**. This is because having OH groups present during the previous steps would cause them to react in unwanted ways, so we can temporarily convert them to something else, then convert them back to OH groups later on. We've only covered doing this sort of thing for carbonyls, but it can apply to many other functional groups. What is the name for this type of group or strategy (two words)? (5 pts)

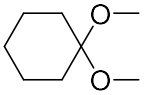
3) Find a way to synthesize the desired product from the given starting material plus any other reagents containing at most six carbon atoms, or triphenylphosphine, or $Pd(PPh_3)_4$. If more than one step is necessary, show the product of each step. Do not show mechanisms. (30 pts - 15 pts each)

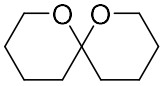
a. 

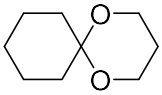
Note: no using molecules with both OH and Cl for Friedel-Crafts!

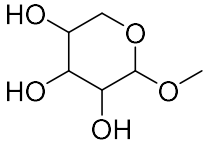
b. 

4) Show <u>all</u> the organic product(s) formed if these compounds were exposed to dilute H_3O^+ and heat. (20 pts)

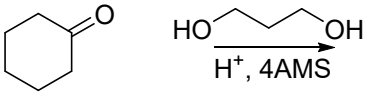
a. 

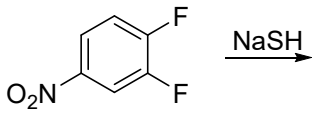
c. 

b. 

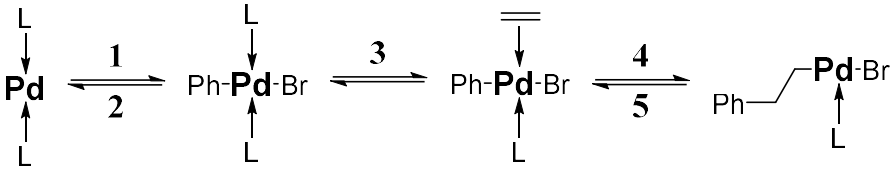
d. 

5) Show the products of these reactions and the mechanism for their formation. Show all major resonance contributors for any intermediates. (20 pts).

a. 

b. 

6) Extra credit! Label steps 1-5 in terms of what kind of transition metal catalysis step is happening (for the forward direction if it's above the arrow, or the reverse direction if it's below). (10 pts e.c.)



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