CHEM 3331 (Richardson) Midterm Exam 1 – Feb. 12, 2019

Your Name: _____

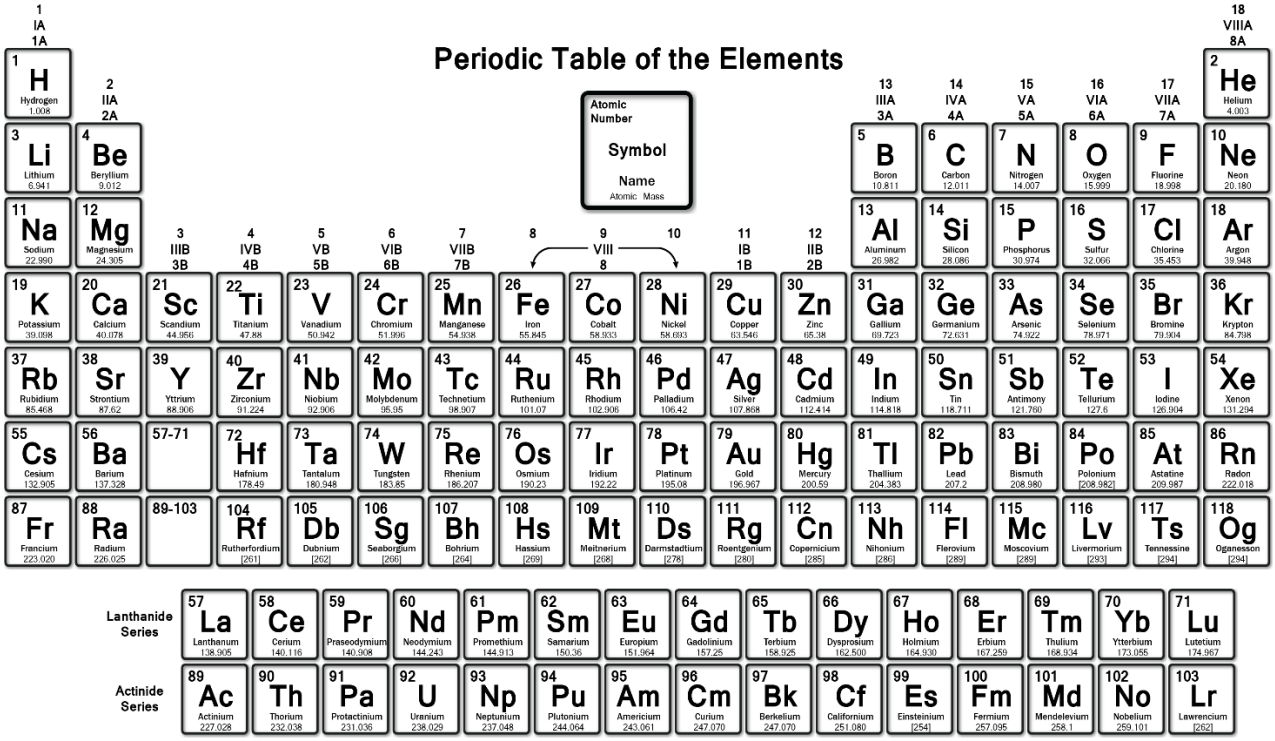
Student ID: _____

Recitation (check one)

O 130 (Wed 8:00 w/ Olivia)
O 134 (Wed 1:00 w/ Olivia)
O 136 (Wed 2:00 w/ Lacey)
O 138 (Wed 4:00 w/ Lacey)
O 141 (Thu 9:00 w/ Chance)
O 143 (Thu 1:00 w/ Chance)
O 145 (Thu 1:00 w/ Lacey)
O 147 (Thu 3:00 w/ Will)
O 149 (Thu 5:00 w/ Will)
O 235 (Wed 1:00 w/ Lauren)
O 237 (Wed 3:00 w/ Lauren)
O 239 (Wed 5:00 w/ Zepeng)
O 240 (Thu 8:00 w/ Zhenhao)
O 242 (Thu 1:00 w/ Lauren)
O 244 (Thu 1:00 w/ Lauren)
O 246 (Thu 2:00 w/ Brianna)
O 248 (Thu 4:00 w/ Brianna)

Question	Score	Out of
1		15
2		10
3		20
4		10
5		10
6		15
7		20
8		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

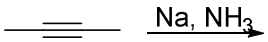
HI	-10	CH_3COOH	4.7	ArOH	10	HC≡CH	26
HBr	-8	HN_3	4.7	RSH	10-12	H_2	35
HCl	-6	H_2S	7.0	H_2O	15.7	NH_3	36
H_3O^+	-1.7	NH_4^+	9.3	ROH	16-18	$H_2C{=}CH_2$	45
HF	3.2	HCN	9.4	O=C-CH	9-25	CH_4	60

1) When 3,4-dimethyl-2,4-hexadiene reacts with one equivalent of HBr, two products are formed. (15 pts total)
   a. Draw the 1,2-addition product and the mechanism for its formation. (5 pts)

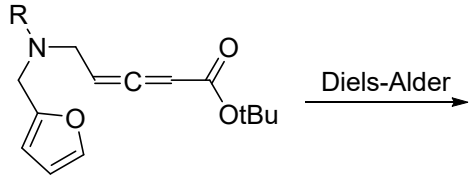
   b. Draw the 1,4-addition product and the mechanism for its formation. (5 pts)

   c. Which of these products is the kinetic and which is the thermodynamic? (5 pts)

2) Show the mechanism and product for this reaction. (10 pts)



3) In a recently-published synthesis of yohimbine (used in folk medicine as an aphrodisiac), the Diels-Alder reaction was used to form a new ring during a key step. (20 pts total)

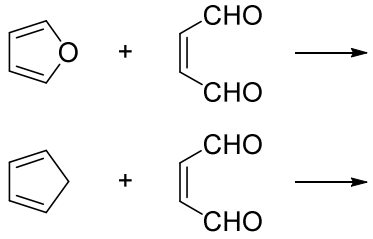


a. Draw a circle around the four atoms of the diene group in this molecule. (2 pts)

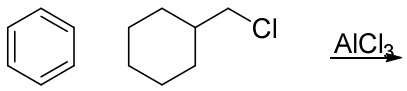
b. Draw a square around the two atoms of the best dienophile group in this molecule. (2 pts)

c. Draw the product of this reaction, ignoring stereochemistry. (10 pts)

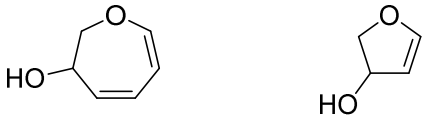
d. Of the two reactions below, which do you expect to favor the product more, and why? (6 pts)



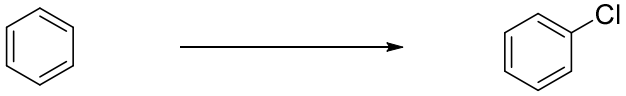
4) Show the mechanism and product for this reaction, assuming only a single addition occurs. (10 pts)

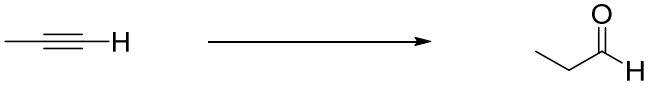


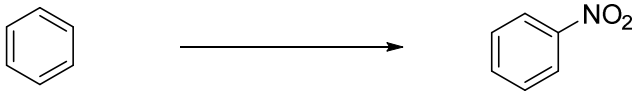
5) Of the compounds shown below, one undergoes acid-catalyzed dehydration more rapidly than the other. Which one is it, and why? (10 pts)

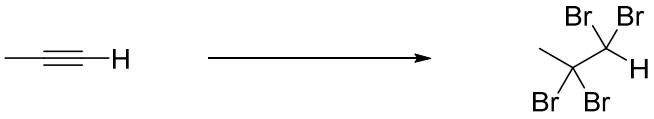


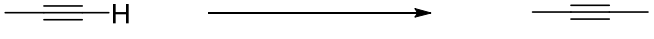
6) Fill in the reagents needed for the following reactions. (15 pts; 3 pts each)

a. 

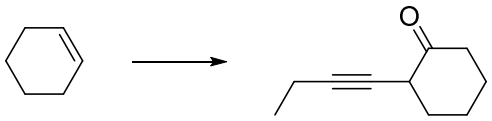
b. 

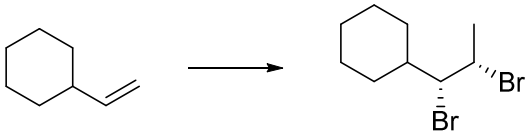
c. 

d. 

e. 

7) 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. (20 pts - 10 pts each)

a. 

b. 

8) Extra credit! Show the product that would be formed by these two compounds, **including all stereochemistry,** assuming the reaction is under kinetic control. (10 pts extra credit)