CHEM 3311 (Richardson) Third Hour Exam – November 13, 2012

Your Name _____

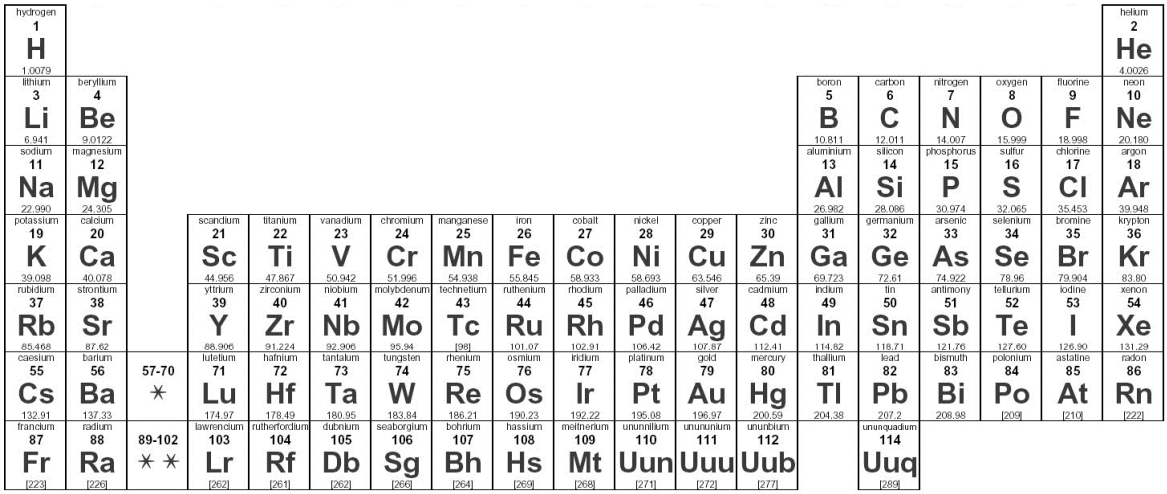
Student ID No. _____

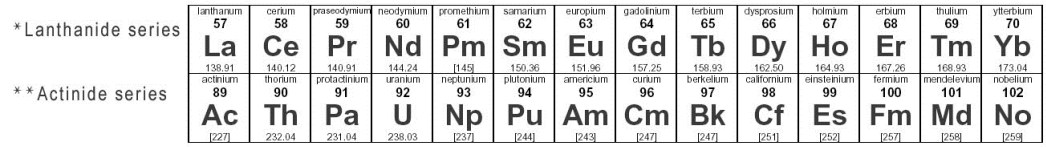
Recitation Day/Time _____

Recitation TA (circle one) Thomas Carey, Adam Csakai, Jake Greenberg, Maria Kolber, Tim Rochelle, Mike Springer

Question	Score	Out of
1		16
2		18
3		8
4		10
5		12
6		16
7		20
Total		100

This is a closed-book exam. The use of notes, calculators, scratch paper, or cell phones will not be allowed during the exam. You may use models sets brought in a clear ziplock bag. Use the backs of the pages for scratch work. Please put all your final answers on the test in pen, not pencil. 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.



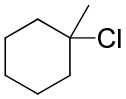


pKa Values

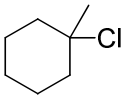
HI	-10	HN_3	4.7	H_2O	15.7
HBr	-8	H_2S	7.0	Alcohol (ROH)	16-18
HCl	-6	NH_4^+	9.3	HC≡CH	26
H_3O^+	-1.7	HCN	9.4	NH_3	36
HF	3.2	Phenol	10	$H_2C{=}CH_2$	45
CH_3COOH	4.7	RSH	10-12	CH_4	60

 Name_____

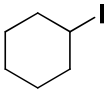
1) For each of the reactions shown below, **circle the mechanism(s)** you would expect to see, if any, and **draw the product(s)**. If a mixture of stereoisomers is formed, show all stereoisomers using wedges and dashes to indicate configuration. If an elimination occurs, show only the major alkene product. If none of the mechanisms would take place in a reasonable time frame, write NR for No Reaction. (2 pts each)

a.  $\xrightarrow[CH_3OH]{CH_3ONa}$

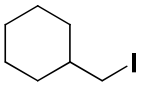
E2	S_N2
E1	S_N1

b.  $\xrightarrow[tBuOH]{tBuOK}$

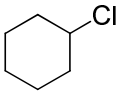
E2	S_N2
E1	S_N1

c.  $\xrightarrow[DMSO]{KBr}$

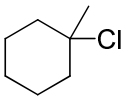
E2	S_N2
E1	S_N1

d.  $\xrightarrow[tBuOH]{tBuOK}$

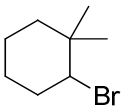
E2	S_N2
E1	S_N1

e.  $\xrightarrow[CH_3COOH]{CH_3COONa}$

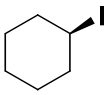
E2	S_N2
E1	S_N1

f.  $\xrightarrow{CH_3OH}$

E2	S_N2
E1	S_N1

g.  $\xrightarrow[CH_3OH]{CH_3SNa}$

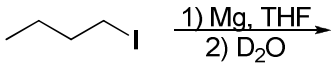
E2	S_N2
E1	S_N1

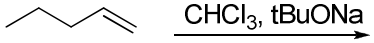
h.  $\xrightarrow[CH_3OH]{CH_3SNa}$

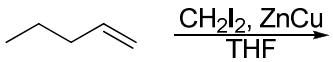
E2	S_N2
E1	S_N1

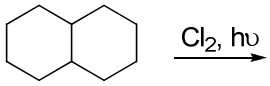
 Name_____

2) For each reaction shown below, predict the organic product(s). Ignore stereochemistry. (3 pts each)

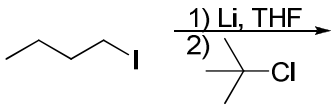
a. 

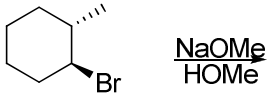
b. 

c. 

d. 

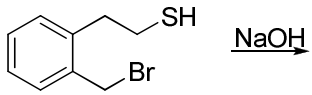
Show monochlorination products only.

e. 

f. 

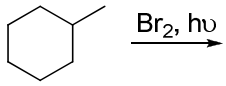
 Name_____

3) Mechanism 1:
   a. When the molecule shown below is allowed to react with sodium hydroxide, a product is formed that has the formula $C_9H_{10}S$. Predict the structure of the product. (2 pts)



   b. Write an arrow-pushing mechanism for this reaction. (6 pts)

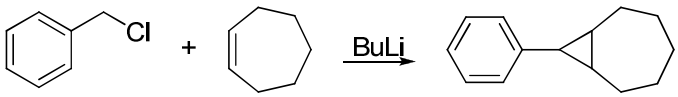
4) Mechanism 2:
   a. Predict the major product(s) of the reaction shown below, ignoring stereochemistry. (2 pts)



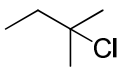
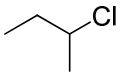
   b. Write an arrow-pushing mechanism for this reaction. Clearly label your initiation, propagation and termination steps, and show at least two examples of termination. (8 pts)

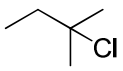
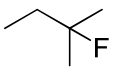
 Name_____

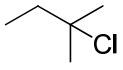
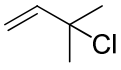
5) Write an arrow-pushing mechanism for the reaction shown below. (Hint: what kind of new ring are you forming? What other reactions do that, and how do they work?) (12 pts)

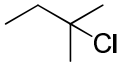
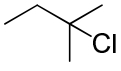


6) For each of the following pairs of reactions, circle the one that would be faster at S_N1 and explain why in under ten words. If both are equal, do not circle an option. (4 pts each)

a.  + CH_3OH  + CH_3OH

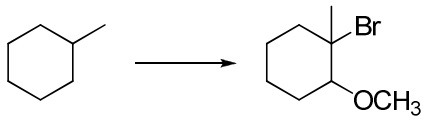
b.  + CH_3OH  + CH_3OH

c.  + CH_3OH  + CH_3OH

d.  + DMF + Br^-  + DMF + F^-

 Name_____

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)

a. 

b.