CHEM 3311 (Richardson) First Hour Exam – February 10, 2015

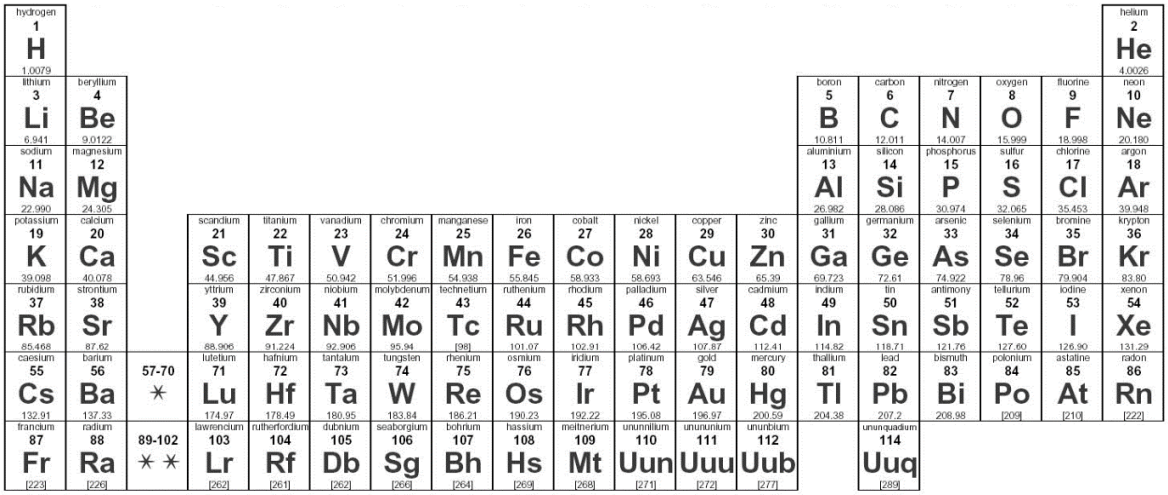
Your Name _____

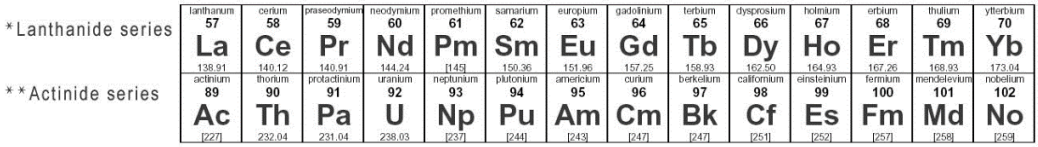
Student ID _____

Recitation Time 12:00 Monday, 1:00 Monday,
11:00 Tuesday, 1:00 Tuesday,
12:00 Wednesday

Question	Score	Out of
1		5
2		20
3		25
4		15
5		15
6		20
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 ziplock bag. Use the backs of the pages for scratch work. If your final answer is not clearly specified, you will lose points.



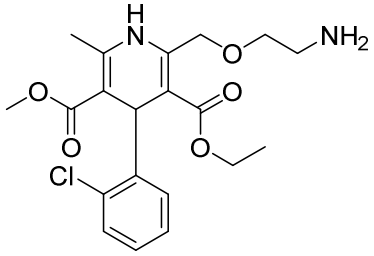


pKa Values

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

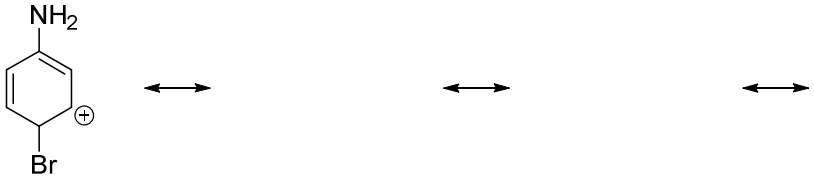
 Name_____

1) Amlodipine, shown below, is used to prevent chest pain and lower blood pressure. Which of the listed functional groups does Amlodipine contain? Circle all that apply. (5 pts)



Aldehyde	Ketone	Amide	Amine	Aromatic ring
Alcohol	Ether	Ester	Alkene	Carboxylic acid

2) Resonance (20 pts total)
   a. Draw three other resonance forms for the molecule shown below. Use valid arrow-pushing to show the movement of electrons. (5 pts each)

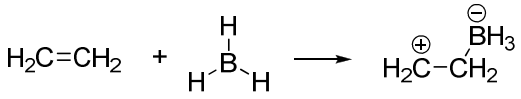


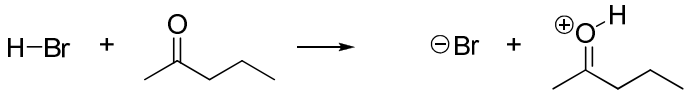
   b. Of these four total resonance forms, one of them is more stable – the form where every atom has a filled octet. Circle this resonance form. (5 pts)

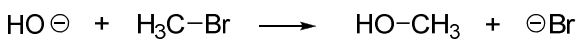
 Name_____

3) Acids and bases (25 pts total)

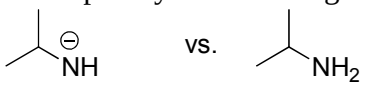
a. Complete each arrow-pushing mechanism and identify the HOMO and LUMO of each reaction. (9 pts)

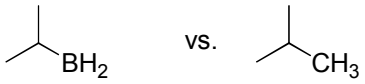


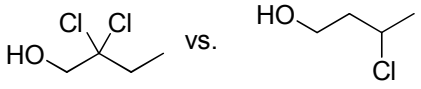


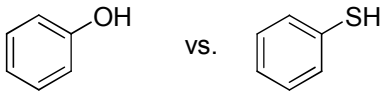


b. For each pair of compounds shown below, select the more acidic of the two compounds and explain your reasoning in fifteen words or fewer. (2 pts each)

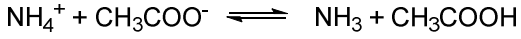
 Reason:

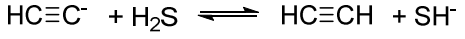
 Reason:

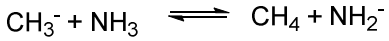
 Reason:

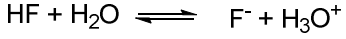
 Reason:

c. For each of the following reactions, does the equilibrium favor the reactants or products? (2 pts each)



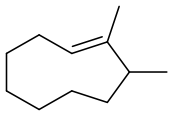


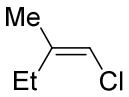


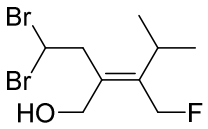


 Name_____

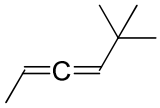
4) Nomenclature and stereoisomers (15 pts total)
   a. Assign an E or Z descriptor to the following molecules. (2 pts each)



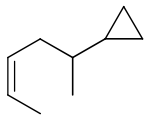




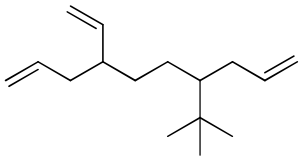
   b. Name the following structures. Include E/Z descriptors where appropriate. (3 pts each)



Name:



Name:



Name:

5) Molecular Orbitals (15 pts total)
   a. Draw an MO diagram for the H_2^- ion (note the negative charge on this ion). (10 pts)

   b. What is the bond order between the two hydrogen atoms in this ion? (5 pts)

 Name_____

6) Alkene structure and stability (20 pts)
   a. Using skeletal structures, draw every alkene with the formula C_5H_{10}. If a structure has different E/Z stereoisomers possible, show both of them. (2 pts each)

   b. Out of the alkenes you drew for part (a), which is the most stable? Which is the least stable? (4 pts)

   c. How many degrees of unsaturation do each of the structures you drew for part (a) have? (4 pts)