

**CHEM 3311 (Luca) Second Hour Exam – March 13<sup>th</sup> 2018**

Your Name: \_\_\_\_\_

Student ID: \_\_\_\_\_

**Recitation (Check one):**

- Monday 8am - Mori
- Monday 9am - Carey
- Monday 10am - Carey
- Monday 11am - Carey
- Tue 8am - Park
- Tue 11am - Carey
- Tue 2pm - Carey

Question	Points
1	
2	
3	
4	
5	
<b>Total</b>	

This is a closed-book exam. The use of notes and cell phones will not be allowed during the exam. You may use models sets totally dismantled brought in a clear quart-sized ziplock bag. Use the backs of the pages for scratch work. If your final answer is not clearly specified in the given space, points will not be awarded.

The periodic table includes elements from Hydrogen (1) to Oganesson (118). It also includes the Lanthanide series (57-71) and Actinide series (89-103) shown below the main table.

**pKa Values**

HI	-10	CH <sub>3</sub> COOH	4.7	ArOH	10	H <sub>2</sub>	35
HBr	-8	HN <sub>3</sub>	4.7	RSH	10-12	NH <sub>3</sub>	36
HCl	-6	H <sub>2</sub> S	7.0	H <sub>2</sub> O	15.7	H <sub>2</sub> C=CH <sub>2</sub>	45
H <sub>3</sub> O <sup>+</sup>	-1.7	NH <sub>4</sub> <sup>+</sup>	9.3	ROH (R=alkyl)	16-18	CH <sub>4</sub>	60
HF	3.2	HCN	9.4	HC≡CH	26		

Name \_\_\_\_\_

1. (20 points total)

Write the starting material, reagents and **a MAJOR product** for the reaction of hydroboration/oxidation of (E)-3-methyl-2-pentene. **Clearly indicate whether the addition product is syn or anti and assign the absolute stereochemistry for the product drawn.**

Starting Material (2 points)

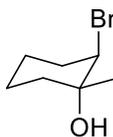
Reagents (8 points)

Product (15 points)

Name \_\_\_\_\_

2. (20 points total)

Propose a one-step synthesis for the molecule below from a molecule with the same number of carbon atoms. Please write your answers in the boxes below for steps a and b.



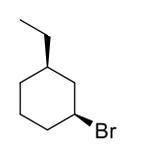
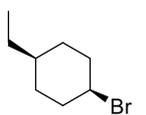
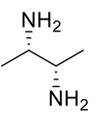
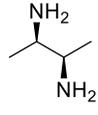
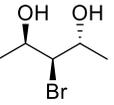
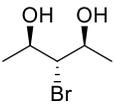
- a. Show a summary of the reaction clearly indicating the starting materials, the reagents and reaction conditions. (5 points)

- b. Show a detailed mechanism for all the steps in the formation of the product shown. (15 points)

Name \_\_\_\_\_

3. (20 points total)

For the structures shown below indicate the absolute configuration for each of the stereocenters (14 points) next to each of the stereocenters. **In the right-hand box**, clearly indicate what types of isomers they are and whether the compounds are enantiomers, diastereomers or identical where such relationship can be applied. Write none if no such relationship is applicable. (6 points).

a.			Type of isomer:  Relationship:
b.			Type of isomer:  Relationship:
c.			Type of isomer:  Relationship:

Name \_\_\_\_\_

4. (20 points total)

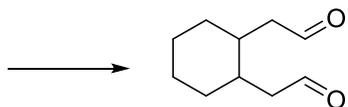
Give an example of an alkoxymercuration/reduction **reaction on a trisubstituted** alkene. Clearly indicate your starting material, reagents for each of the steps and products (4 points). In addition, emphasize the regio- and stereochemical outcome (*syn/anti*) of the addition (4 points) and provide a detailed mechanism for this reaction (no detailed mechanism required for the reduction step) (12 points).

Name \_\_\_\_\_

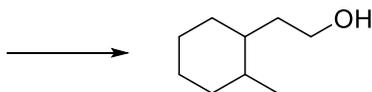
5. (20 points total, 5 points each)+ (10 points bonus question)

Using reactions covered in class, propose a synthesis for the compounds shown below. The compounds **need to be major products** of the reactions shown. Write your starting material before the arrow, and the other reagents above or below the arrow and explicitly indicate the various steps.

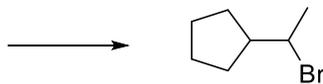
a.



b.



c.



d.



(10 points bonus question)

Propose the synthesis of the compound below using a reaction that includes a 1,2-hydride shift step:

e.

