### Fall Semester 2013

Organic Chemistry I Midterm Examination #1

Name (print):

Name (sign):

Recitation Instructor (name, day):

#### **Instructions**

- 1. Keep the exam closed until you are instructed to begin.
- 2. The exam consists of 10 questions. The first thing you should do is make sure that no pages are missing. If a page is missing, notify a proctor immediately
- 3. You will have 1 hour and 15 minutes. Questions are labeled from easy (\*) to hard(\*\*\*). Budget your time wisely.
- 4. Make sure to show all of your work, and this should fit into the space provided. If you need to use the back of the paper, you must make note of it in the space provided for credit.

## Good Luck!

- 1. \_\_\_ (5 points)
- 2. \_\_\_ (5 points)
- *3.* \_\_\_(10 points)
- 4. \_\_\_(10 points)
- 5. \_\_\_(10 points)
- 6. \_\_\_(10 points)
- 7. \_\_\_(10 points)
- 8. \_\_\_(10 points)
- 9. \_\_\_(20 points)
- 10. \_\_\_(10 points)



#### **Periodic Table of the Elements**

Ground State Electron Configurations

						Gr	ound St	ate Elect	ron Con	figuratio	ns						
1A	http://chemistry.about.com															8A	
1													©2012 Todd Helmenstine				
H						About Chemistry  3A 4A 5A 6A 7A					He						
1s <sup>1</sup>	2A												4A	5A	6A	7A	1s <sup>2</sup>
3	4											5	6	7	8	9	10
Li	Be											В	С	N	0	F	Ne
1s <sup>2</sup> 2s <sup>1</sup>	1s <sup>2</sup> 2s <sup>2</sup>	1										1s <sup>2</sup> 2s <sup>2</sup> p <sup>1</sup>	1s <sup>2</sup> 2s <sup>2</sup> p <sup>2</sup>	1s <sup>2</sup> 2s <sup>2</sup> p <sup>3</sup>	1s <sup>2</sup> 2s <sup>2</sup> p <sup>4</sup>	1s <sup>2</sup> 2s <sup>2</sup> p <sup>6</sup>	1s <sup>2</sup> 2s <sup>2</sup> p <sup>6</sup>
11	12											13	14	15	16	17	18
Na	Mg											Al	Si	Р	S	CI	Ar
[Ne]3s <sup>1</sup>	[Ne]3s²	3B	4B	5B	6B	7B		— 8B —		1B	2B	[Ne]3s <sup>2</sup> p <sup>1</sup>	[Ne]3s <sup>2</sup> p <sup>2</sup>	[Ne]3s <sup>2</sup> p <sup>3</sup>	[Ne]3s <sup>2</sup> p <sup>4</sup>	[Ne]3s <sup>2</sup> p <sup>5</sup>	[Ne]3s <sup>2</sup> p <sup>6</sup>
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
(Ar)4s <sup>1</sup>	[Ar]4s <sup>2</sup>	[Ar]3d <sup>1</sup> 4s <sup>2</sup>	[Ar]3d <sup>2</sup> 4s <sup>2</sup>	[Ar]3d <sup>3</sup> 4s <sup>2</sup>	[Ar]3d <sup>5</sup> 4s <sup>1</sup>	[Ar]3d <sup>5</sup> 4s <sup>2</sup>	[Ar]3d <sup>6</sup> 4s <sup>2</sup>	[Ar]3d <sup>7</sup> 4s <sup>2</sup>	[Ar]3d <sup>8</sup> 4s <sup>2</sup>	[Ar]3d <sup>10</sup> 4s <sup>1</sup>	[Ar]3d <sup>10</sup> 4s <sup>2</sup>	[Ar]3d <sup>10</sup> 4s <sup>2</sup> p <sup>1</sup>	(Ar]3d <sup>10</sup> 4s <sup>2</sup> p <sup>2</sup>		[Ar]3d <sup>10</sup> 4s <sup>2</sup> p <sup>4</sup>	[Ar]3d <sup>10</sup> 4s <sup>2</sup> p <sup>5</sup>	[Ar]3d <sup>10</sup> 4s <sup>2</sup> p <sup>6</sup>
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
Rb	Sr	Y	Zr	Nb	Мо	Tc	Ru	Rh	Pd	Ag	Cd	ln	Sn	Sb	Te	'	Xe
[Kr]5s <sup>1</sup>	[Kr]5s <sup>2</sup>	[Kr]4d <sup>1</sup> 5s <sup>2</sup>	[Kr]4d <sup>2</sup> 5s <sup>2</sup>	[Kr]4d <sup>4</sup> 5s <sup>1</sup>	[Kr]4d <sup>6</sup> 5s <sup>1</sup>	[Kr]4d <sup>6</sup> 5s <sup>2</sup>	[Kr]4d <sup>7</sup> 5s <sup>1</sup>	[Kr]4d <sup>8</sup> 5s <sup>1</sup>	[Kr]4d <sup>10</sup>	[Kr]4d <sup>10</sup> 5s <sup>1</sup>	[Kr]4d <sup>10</sup> 5s <sup>2</sup>	[Kr]4d <sup>10</sup> 5s <sup>2</sup> p <sup>1</sup>	[Kr]4d <sup>10</sup> 5s <sup>2</sup> p <sup>2</sup>				[Kr]4d <sup>10</sup> 5s <sup>2</sup> p <sup>6</sup>
55	56	57-71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86
Cs	Ва		Hf	Ta	W	Re	Os	lr	Pt	Au	Hg	TI	Pb	Bi	Po	At	Rn
[Xe]6s <sup>1</sup>	[Xe]6s <sup>2</sup>	Lanthanides		[Xe]#1 <sup>4</sup> 5d <sup>3</sup> 6s <sup>2</sup>	[Xe 4f <sup>M</sup> 5d <sup>4</sup> 6s <sup>2</sup>	[Xe]4f <sup>14</sup> 5d <sup>6</sup> 6s <sup>2</sup>	[Xe]48 <sup>14</sup> 5d <sup>8</sup> 6s <sup>2</sup>	[Xe]4f <sup>14</sup> 5d <sup>7</sup> 6s <sup>2</sup>	[Xe]4f <sup>14</sup> 5d <sup>8</sup> 6s <sup>1</sup>	[Xe]4f <sup>14</sup> 5d <sup>10</sup> 6s <sup>1</sup>	[Xe]4f <sup>34</sup> 5d <sup>18</sup> 6s <sup>2</sup>	[Xe]4f <sup>14</sup> 5d <sup>10</sup> 6s <sup>2</sup> p <sup>1</sup>	[Xe]4f <sup>4</sup> 5d <sup>46</sup> 6s <sup>2</sup> p <sup>2</sup>	[Xe]4f <sup>4</sup> 5d <sup>40</sup> 6s <sup>2</sup> p <sup>3</sup>		[Xe]4f <sup>4</sup> 5d <sup>6</sup> 6s <sup>2</sup> p <sup>5</sup>	[Xe]41*5d*6s²p6
87	88	89-103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118
Fr	Ra		Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Uut	FI	Uup	Lv	Uus	Uuo
(Rn)7s <sup>1</sup>	[Rn]7s <sup>2</sup>	Actinides	[Rn 9f <sup>M</sup> 6d <sup>2</sup> 7s <sup>2</sup> *	[Rn]5f <sup>14</sup> 6d <sup>3</sup> 7s <sup>2</sup> *	[Rn]5f <sup>54</sup> 6d <sup>4</sup> 7s <sup>2</sup> *	[Rn]57 <sup>14</sup> 6d <sup>5</sup> 7s <sup>2+</sup>	[Rn]9f <sup>14</sup> 6d <sup>6</sup> 7s <sup>2</sup> *	[Rn]5f <sup>14</sup> 6d <sup>7</sup> 7s <sup>2+</sup>	[Rn]5f <sup>14</sup> 6d <sup>8</sup> 7s <sup>1+</sup>	[Rn]5f <sup>14</sup> 6d <sup>10</sup> 7s <sup>1</sup> *	[Rn 5f <sup>94</sup> 6d <sup>18</sup> 7s <sup>24</sup>	profit**Ed****p**	(Rn)54*64*976*97g <sup>24</sup>	Profit*fed*fa7e*p*	[Rn]5f <sup>14</sup> 6d <sup>10</sup> 7e <sup>2</sup> 7p <sup>4</sup>	[Rn]51 <sup>1</sup> %d <sup>19</sup> 7s <sup>2</sup> 7p <sup>24</sup>	[Rn(51 <sup>14</sup> 6d <sup>10</sup> 7s <sup>2</sup> 7p <sup>4</sup>
			57														
	Lanthanides			58	59	60	61	62	63	64	65	66	67	68	69	70	71
				Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Но	Er	Tm	Yb	Lu
			[Xe]5d <sup>1</sup> 6s <sup>2</sup>	[Xe]4f <sup>1</sup> 5d <sup>1</sup> 6s <sup>2</sup>	[Xe]4f <sup>3</sup> 6s <sup>2</sup>	[Xe]4f <sup>4</sup> 6s <sup>2</sup>	[Xe]4f <sup>6</sup> 6s <sup>2</sup>	[Xe]4f <sup>6</sup> 6s <sup>2</sup>	[Xe]4f <sup>7</sup> 6s <sup>2</sup>	[Xe]4f <sup>2</sup> 5d <sup>1</sup> 6s <sup>2</sup>	[Xe]4f <sup>8</sup> 6s <sup>2</sup>	[Xe]4f <sup>80</sup> 6s <sup>2</sup>	[Xe]4f <sup>11</sup> 6s <sup>2</sup>	[Xe]4f <sup>12</sup> 6s <sup>2</sup>	[Xe]4f <sup>13</sup> 6s <sup>2</sup>	[Xe]4f <sup>14</sup> 6s <sup>2</sup>	[Xe]4f <sup>14</sup> 5d <sup>1</sup> 6s <sup>2</sup>
			89	90	91	92	93	94	95	96	97	98	99	100	101	102	103
Actinides			Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
			[Rn]6d <sup>1</sup> 7s <sup>2</sup>	[Rn]6d <sup>2</sup> 7s <sup>2</sup>	[Rn]5f <sup>2</sup> 6d <sup>1</sup> 7s <sup>2</sup>	[Rn 5f <sup>3</sup> 6d <sup>1</sup> 7s <sup>2</sup>	[Rn]5f <sup>4</sup> 6d <sup>1</sup> 7s <sup>2</sup>	[Rn]5f <sup>2</sup> 7s <sup>2</sup>	[Rn]5f7s2	[Rn]5f <sup>2</sup> 6d <sup>1</sup> 7s <sup>2</sup>	[Rn]5f7s2	[Rn]5f <sup>0</sup> 7s <sup>2</sup>	[Rn]5f <sup>11</sup> 7s <sup>2</sup>	[Rn]5f <sup>2</sup> 7s <sup>2</sup>	[Rn]5f <sup>13</sup> 7s <sup>2</sup>	[Rn]5f <sup>4</sup> 7s <sup>2</sup>	(Rn)5f <sup>14</sup> 6d <sup>1</sup> 7s <sup>2</sup>

<sup>\*</sup> values are based on theory and are not verified

1. Provide an IUPAC Name for the following molecule (5 points).\*

2. What is wrong with the following molecule? There may be more then one thing (5 points)\*

3. What are wrong with the following reaction mechanisms? (10 points)\*

A. 
$$O$$
  $O$   $O$ 

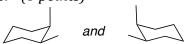
4. Is the following molecule chiral or achiral, and if it is achiral is it meso? (10 points)\*\*

A

В

5. Are the following molecules enantiomers, diastereomers, or identical?\*\* a. (5 points)

b. (5 points)



6. Draw both chair conformations of the following molecule, and circle the one that is lower in energy. (10 points)\*\*

7. Predict the product of the following reaction and show a mechanism.\*\* a. (5 points)

$$CH_3$$
 $Na$ 
 $N_3$ 
 $N_2$ 

b. (5 points)

8. Which of the following reactions would you expect to go faster. Explain your answer.

## a. (5 points)

# b. (5 points)

9. Explain why the oxygen of an amide is more nucleophilic then the nitrogen. (10 points)\*\*.

9b. Why might you expect the oxygen of a 4-member ring lactam to be less lewis basic then a 5 member ring lactam?  $(10 \text{ points})^{***}$ 

10. The following is a reaction called a Ritter reaction. Using what you have learned to date (Acid/Base, Resonance forms, Substitution, Elimination) propose a reasonable mechanism (10 points)\*\*\*