CHEM 3331 (Richardson) Third Midterm Exam – Apr. 17, 2018

Your Name: Key

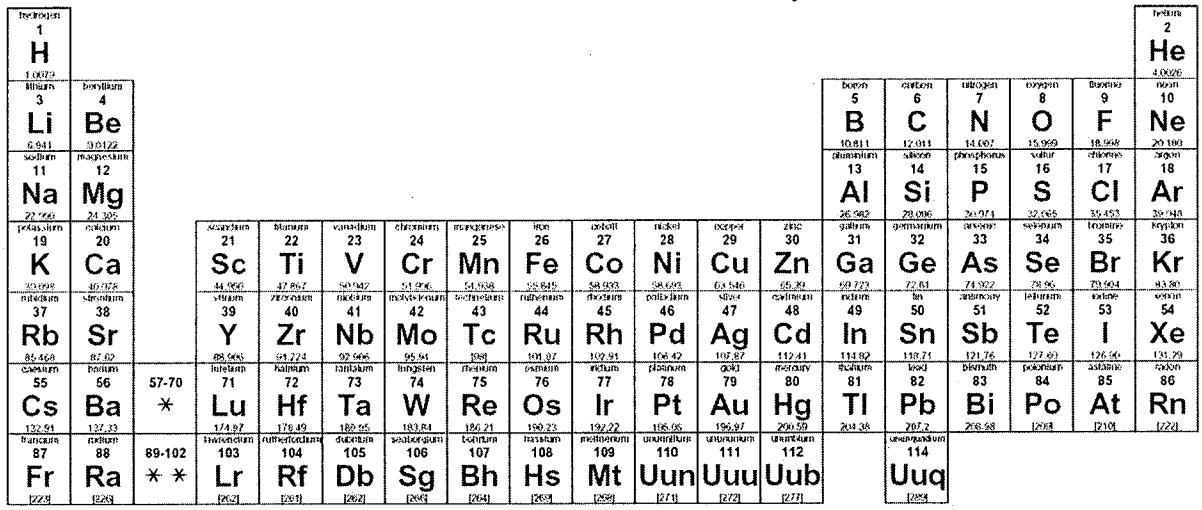
Student ID: _____

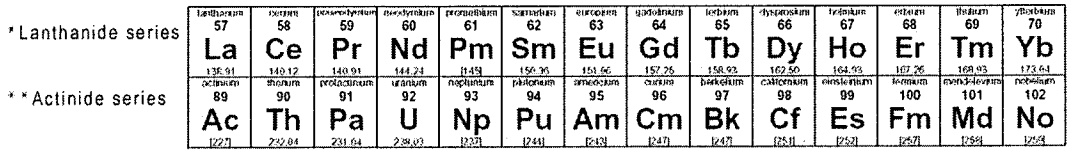
Recitation (check one)

O 12:00 Wed (Patrick Li)
O 4:00 Wed (Michael Ortiz)
O 11:00 Thu (Josh Kamps)
O 3:00 Thu (Rachel Weintraub)
O 8:00 Wed (Rachel Weintraub)
O 2:00 Wed (Patrick Li)
O 9:00 Thu (Josh Kamps)
O 1:00 Thu (Aaron Hinds)
O 5:00 Thu (Rachel Weintraub)

Question	Score	Out of
1		10
2		20
3		20
4		15
5		15
6		20
7		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 ziplock 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. For synthesis, show the product of each synthetic step, but do not show mechanisms. You do not need to show the exact structure of transition metal catalysts.



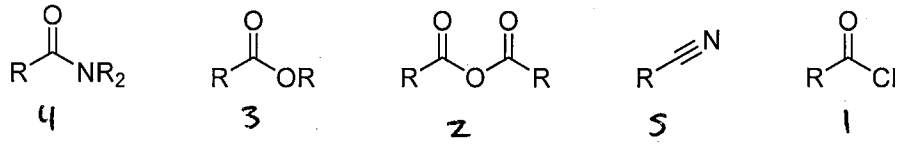


pKa Values

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 (R=alkyl)	16-18	$H_2C{=}CH_2$	45
HF	3.2	HCN	9.4	O=C-CH (α H)	9-25	CH_4	60

(9-pt curve)
Average: 66.6
St Dev: 20.7
Max: 108
Min: 12.5
(before curve)

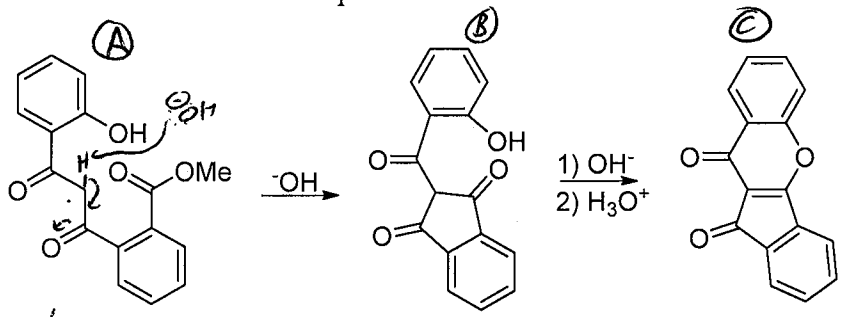
1) Rank these compounds in terms of relative rates of hydrolysis (1 = fastest rate). (10 pts)



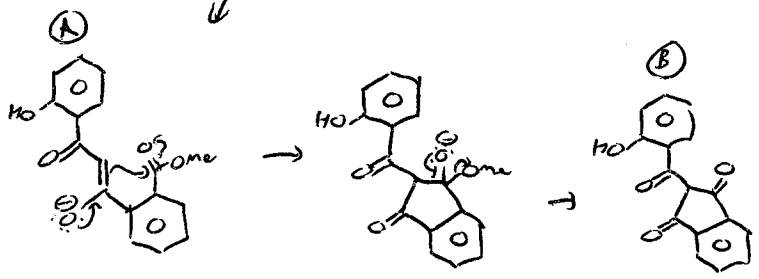
4 3 2 5 1

2 pts each
-4 if only 1 is out of order

2) The product shown below is known to increase the body's production of erythropoietin (EPO), a protein which stimulates the production of red blood cells. The last few steps in the synthesis of this compound are shown below. Propose a reasonable mechanism for each of these steps. (20 pts)

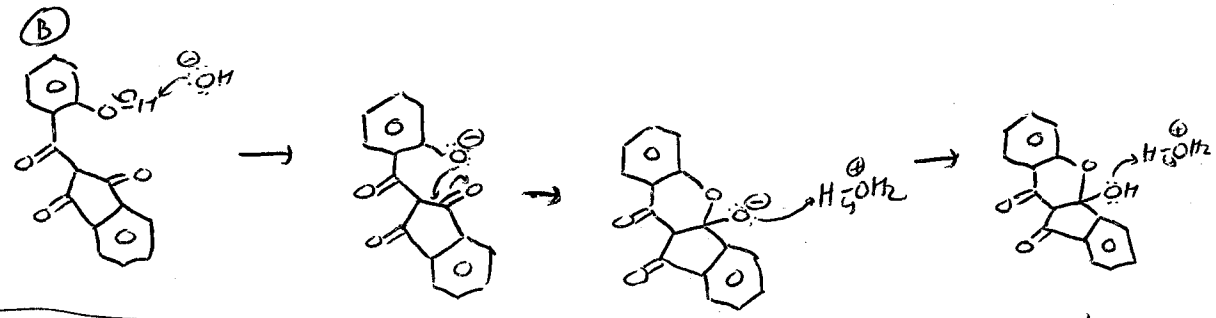


Part 1:

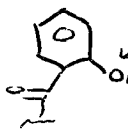


2 pts per int/set of arrows
2 pts for product

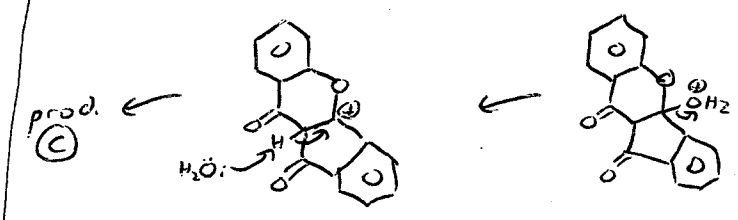
Part 2:



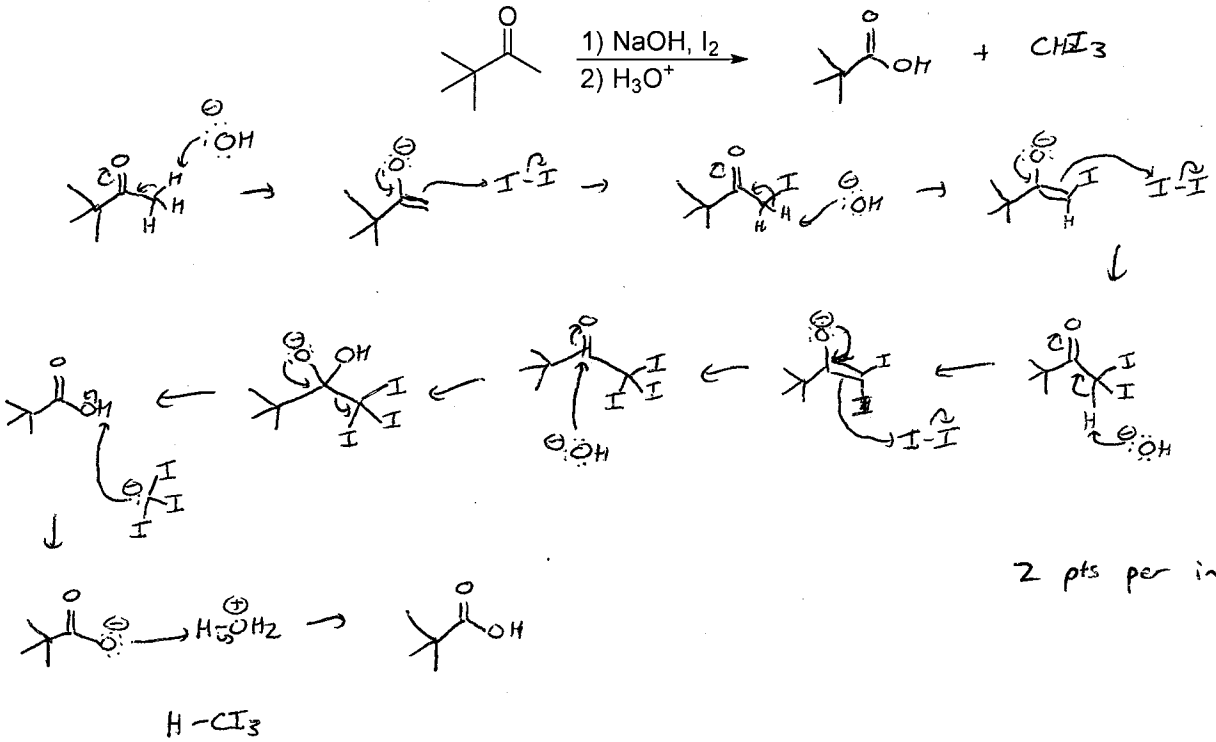
Hint for converting B to C:



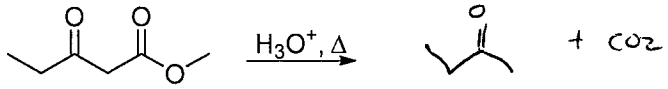
even if we convert to LG, can do S_N1 or S_N2 here (see Ch. 18). So this O has to become the ring O & attack base of C=O.

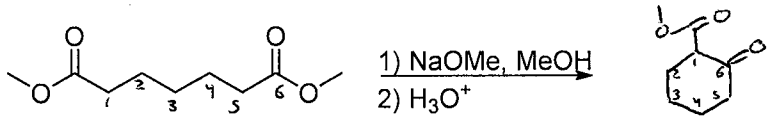


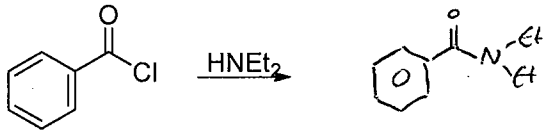
3) Predict the products and show the mechanism for this reaction. (~~15~~ 20 pts)

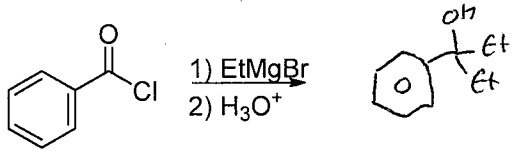


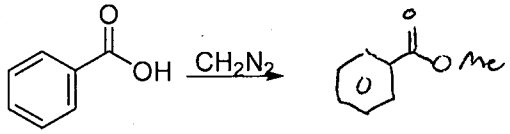
4) Predict the major product of the following reactions. If no reaction occurs, then write NR. Do not show stereochemistry. (15 pts; 3 pts each)

a. 

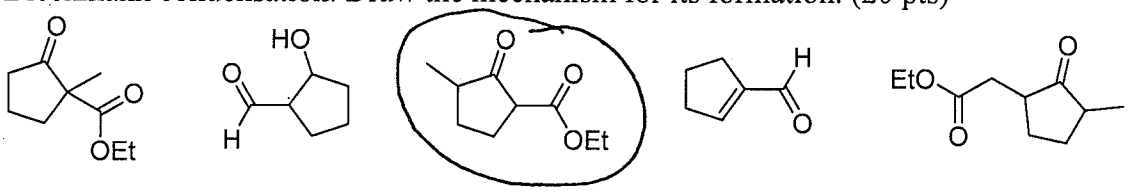
b. 

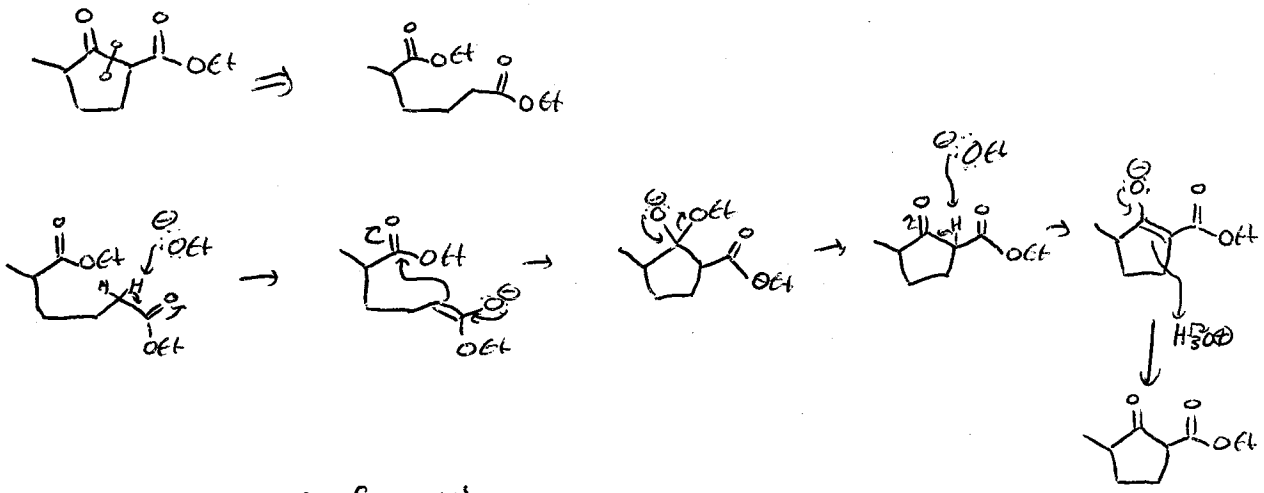
c. 

d. 

e. 

5) Out of the structures shown below, circle the only product that could be made from a Dieckmann condensation. Draw the mechanism for its formation. (~~20~~ 15 pts)

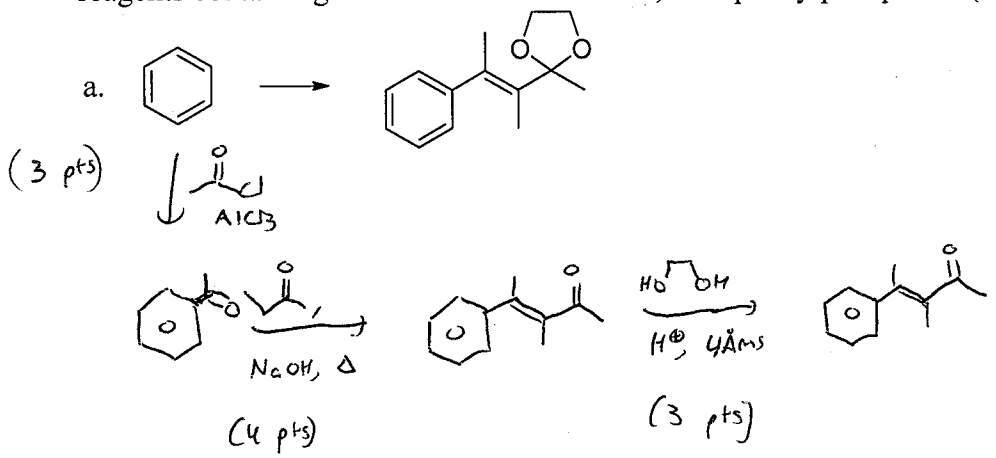




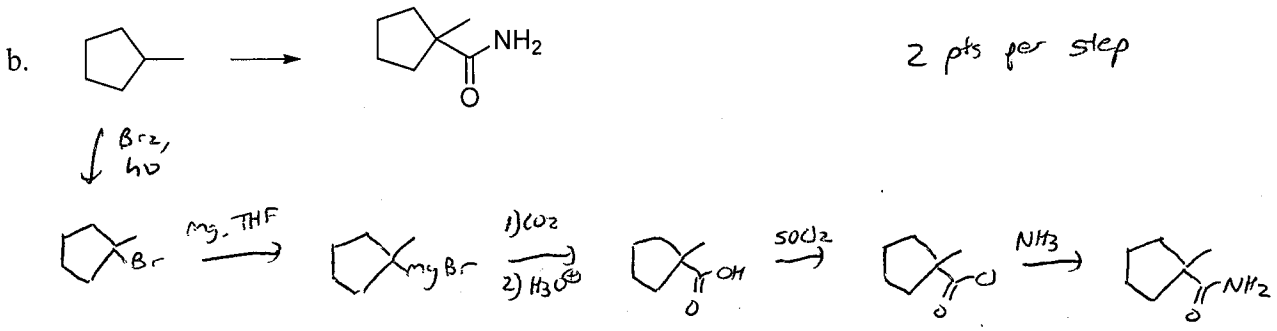
2 pts per int/set of arrows
5 pts for correct choice of precursor

6) Find a way to synthesize the desired product from the given starting material plus any other reagents containing at most six carbon atoms, or triphenylphosphine. (20 pts)

a.



b.



7) Extra credit! Circle every atom in this compound that could be favorably deprotonated by sodium acetylide, NaC≡CH. (10 pts e.c.)