

NAME: _____

Exam 3/610B/Pagenkopf

Email: _____

The exam must be written in ink. No calculators of any sort allowed.
You have 2 hours to complete the exam.

CHEM 610B

Exam 3

Spring 2002

Instructor: Dr. Brian Pagenkopf

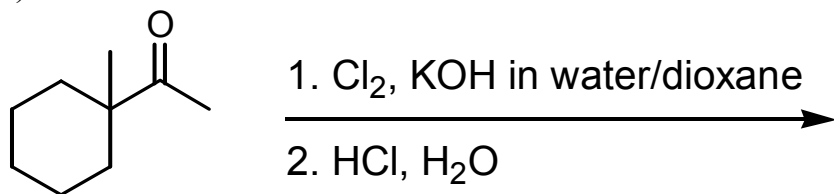
	Page	Points
	2	6
	3	7
	4	9
	5	8
	6	24
Periodic table	7	0
	8	3
	9	16
	10	4
	11	9
	12	4
	13	4
	14	6
		100

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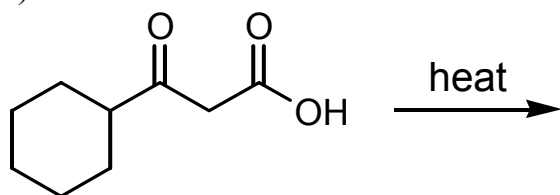
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(7 points). Miscellaneous. Show the products expected to be isolated from each of the following reactions.

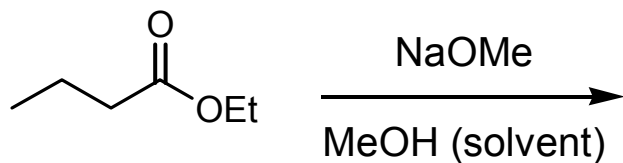
a)



b)

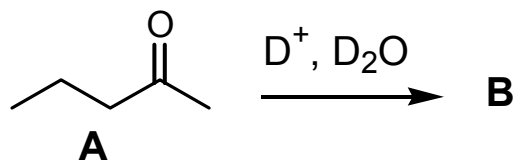


c) At temperatures lower than required for a Claisen reaction, one product would be expected to form under the following reaction conditions. (It's NOT the Claisen product).



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(7 points). NMR.



a) Assume complete deuterium exchange and draw the structure of **B**.

b) How many signals would you expect to see in the 1H NMR for **A**?

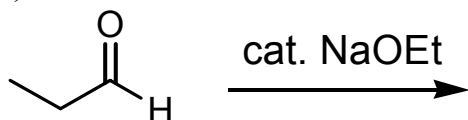
c) After complete deuterium exchange, how many signals would you expect to see in the 1H NMR of **B**?

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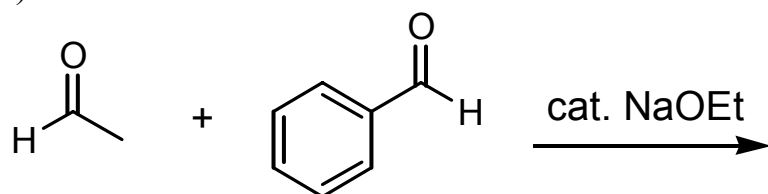
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(9 points). Aldol Reactions. Show the products from the following aldol condensations. For each question where more than one product is possible, show all possible aldol condensation products even if expected to be minor. In each question show the β -hydroxy aldehyde(s) or β -hydroxy ketone(s). Do **not** eliminate or dehydrate to the α,β -unsaturated product. Do not show stereochemistry.

a)



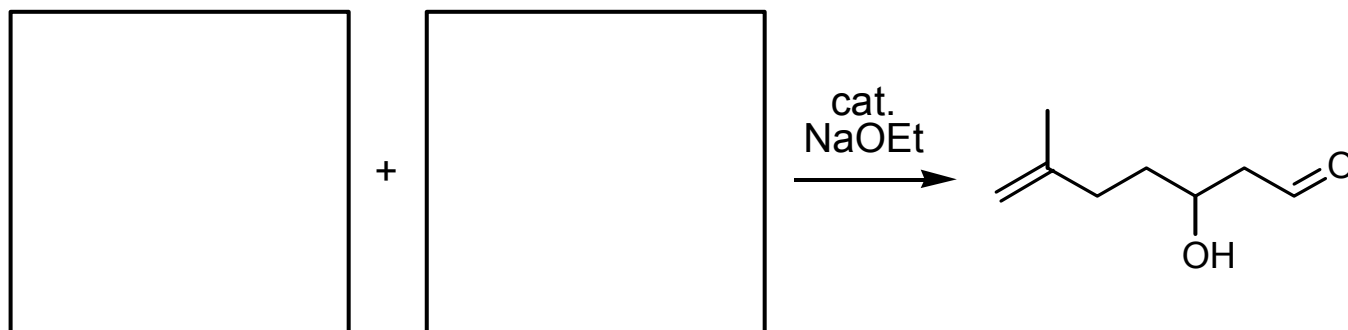
b)



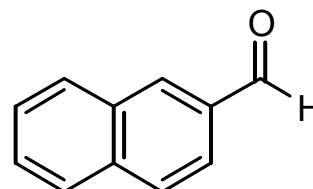
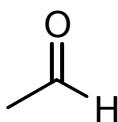
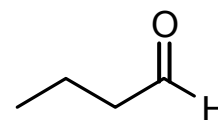
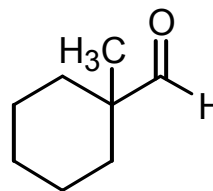
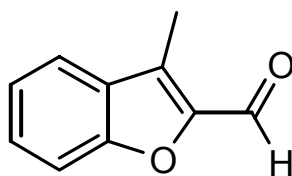
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(6 points) Aldol Reactions. The following molecule was one of several different structures isolated from an aldol condensation reaction. What were the starting materials?



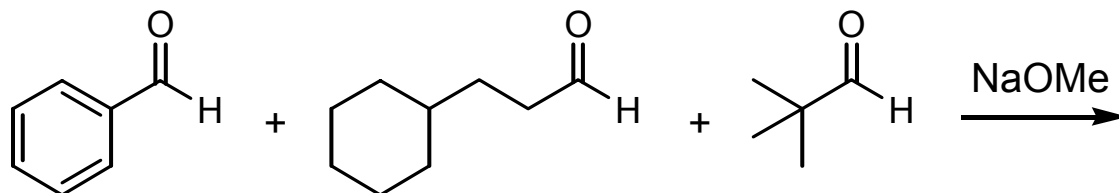
(2 points). How many different aldol condensation products (as β -hydroxy aldehydes) are possible from the following mix of aldehydes, even if expected to be a minor product? Put your answer (a whole number) in the box.



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(24 points). Aldol reactions. Show all the possible aldol products (as β -hydroxy carbonyl compounds) from the following reaction mixture:



Dehydrate the above products and show the corresponding α,β -unsaturated compounds.
(There's additional space on the next page).

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No question this page.

PERIODIC TABLE OF THE ELEMENTS

Atomic masses are based on ¹²C. Atomic masses in parentheses are for the most stable isotope.

6 C 12.011																		2 He 4.00260																	
1 H 1.00079																		10 Ne 20.179																	
3 Li 6.941		4 Be 9.01218																		5 B 10.81		6 C 12.011		7 N 14.0067		8 O 15.9994		9 F 18.998403							
11 Na 22.98977		12 Mg 24.305														13 Al 26.98154		14 Si 28.0855		15 P 30.97376		16 S 32.06		17 Cl 35.453		18 Ar 39.948									
19 K 39.0963		20 Ca 40.08		21 Sc 44.9559		22 Ti 47.90		23 V 50.9415		24 Cr 51.996		25 Mn 54.9380		26 Fe 55.847		27 Co 58.9332		28 Ni 58.70		29 Cu 63.546		30 Zn 65.38		31 Ga 69.72		32 Ge 72.59		33 As 74.9216		34 Se 78.96		35 Br 79.904		36 Kr 83.80	
37 Rb 85.4678		38 Sr 87.62		39 Y 88.9059		40 Zr 91.22		41 Nb 92.9064		42 Mo 95.94		43 Tc (98)		44 Ru 101.07		45 Rh 102.9055		46 Pd 106.4		47 Ag 107.868		48 Cd 112.41		49 In 114.82		50 Sn 118.69		51 Sb 121.75		52 Te 127.60		53 I 126.9045		54 Xe 131.30	
55 Cs 132.9054		56 Ba 137.33		57 La 138.9055		* 72 Hf 178.49		73 Ta 180.9479		74 W 183.85		75 Re 186.207		76 Os 190.2		77 Ir 192.22		78 Pt 195.09		79 Au 196.9665		80 Hg 200.59		81 Tl 204.37		82 Pb 207.2		83 Bi 208.9804		(209)		85 At (210)		86 Rn (222)	
87 Fr (223)		88 Ra (226.0254)		89 Ac (227.0278)		† 104 Unq (261)		105 Unp (262)		106 Unh (263)																									

*Lanthanide series

58 Ce 140.12	59 Pr 140.9077	60 Nd 144.24	61 Pm (145)	62 Sm 150.4	63 Eu 151.96	64 Gd 157.25	65 Tb 158.9254	66 Dy 162.50	67 Ho 164.9304	68 Er 167.26	69 Tm 168.9342	70 Yb 173.04	71 Lu 174.967
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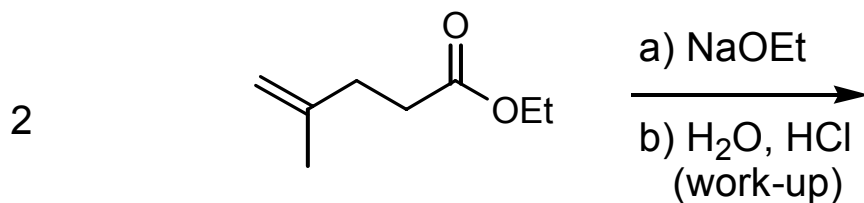
† Actinide series

90 Th 232.0381	91 Pa 231.0359	92 U 238.029	93 Np 237.0482	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (260)
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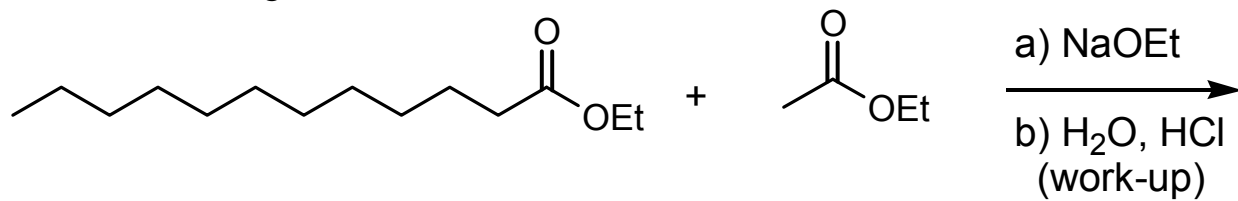
(3 points). Claisen and Diekmann Reactions. Draw the major product(s) expected from the following reaction.



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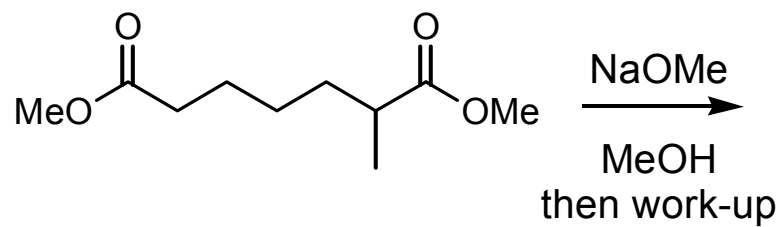
(16 points). Claisen and Diekmann Reactions. Draw the four major products(s) expected from the following reaction.



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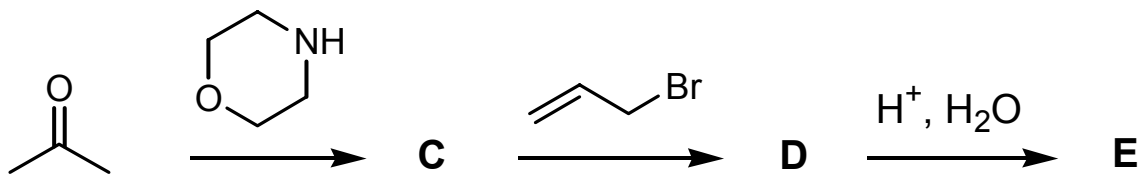
(4 points). Claisen and Diekmann Reactions. Draw both products expected from the following Diekmann reaction.



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(9 points). The following Stork enamine synthesis was used to make compound **E**. Show the structure of **C**, the salt **D** and product **E**.



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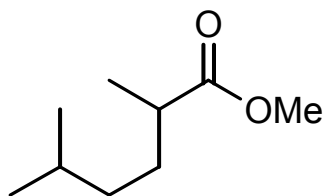
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(4 points). The product **E** on the preceding page can also be prepared by the acetoacetic ester synthesis. Show all the reagents and steps necessary for its synthesis.

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(4 points). Show how to synthesize the following compounds using either the malonic ester synthesis or the acetoacetic ester synthesis by providing the necessary reagents and conditions. Show all required steps.



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(6 points). Synthesis. Propose a synthesis of the following compound using any reagents you like with the only restriction that they can only add four carbons or less to the target molecule.

