

Keg

Name: _____

F

(Print your name clearly!)

Sametz: CHEM 322 2010
Organic Chemistry Exam 2

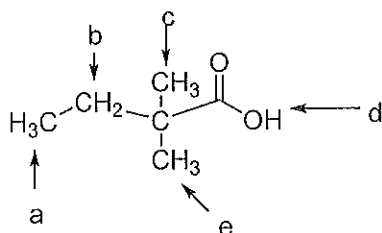
All answers should be written CLEARLY in the space provided. (If it's not clear, it's wrong).

																1																	18				
																H 1.008																	He 4.003				
		3	4																	5	6	7	8	9	10	11	12	13	14	15	16	17	18				
		Li 6.941	Be 9.012																	B 10.81	C 12.011	N 14.007	O 15.999	F 18.00	Ne 20.18												
		11		12																		13		14		15		16		17		18					
		Na 22.989		Mg 24.305																		Al 26.982		Si 28.086		P 30.974		S 32.06		Cl 35.453		Ar 39.948					
		19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
		K 39.098	Ca 40.08	Sc 44.96	Ti 47.90	V 50.94	Cr 52.00	Mn 54.94	Fe 55.85	Co 58.93	Ni 58.70	Cu 63.55	Zn 65.38	Ga 69.72	Ge 72.59	As 74.92	Se 78.96	Br 79.90	Kr 83.8																		
		37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	
		Rb 85.468	Sr 87.62	Y 88.906	Zr 91.22	Nb 92.906	Mo 95.94	Tc (98)	Ru 101.1	Rh 102.9	Pd 106.4	Ag 107.9	Cd 112.4	In 114.8	Sn 118.7	Sb 121.8	Te 127.60	I 126.9		Xe 131.3																	
		55	56	57	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86																		
		Cs 132.9	Ba 137.3	La 138.9	Hf 178.49	Ta 180.9	W 183.9	Re 186.2	Os 190.2	Ir 192.2	Pt 195.1	Au 197	Hg 200.6	Tl 204.4	Pb 207.2	Bi 209	Po (209)	At (210)	Rn (222)																		
		87	88	89	104	105	106	107	108	109																											
		Fr (223)	Ra 226	Ac 227	Rf (261)	Db (262)	Sg (266)	Bh (264)	Hs (269)	Mt (268)																											
		59	60	61	62	63	64	65	66	67	68	69	70	71																							
		Ce 140.1	Pr 140.9	Nd 144.2	Pm (145)	Sm 150.4	Eu 152	Gd 157.3	Tb 158.9	Dy 162.5	Ho 164.9	Er 167.3	Tm 168.9	Yb 173	Lu 175																						
		90	91	92	93	94	95	96	97	98	99	100	101	102	103																						
		Th 232	Pa 231	U 238	Np 237	Pu (244)	Am (243)	Cm (247)	Bk (247)	Cf (251)	Es (252)	Fm (257)	Md (258)	No (259)	Lr (262)																						

You may raise your hand to ask a question if you are unsure what a question is asking of you.

Part I: Multiple Choice (14 points)

For the following compound:



1. How many signals do you expect to see in the proton NMR?

- a) 3
- b) 4
- c) 5
- d) 9
- e) 12

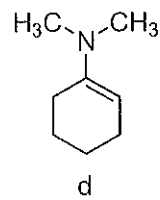
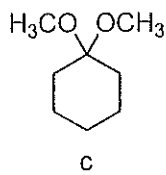
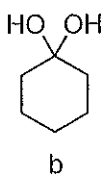
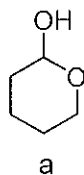
2. Which of the indicated protons should appear the furthest **downfield** in the proton NMR?

- a) a
- b) b
- c) c
- d) d
- e) e

3. What should be the splitting pattern of the **b** protons?

- a) singlet
- b) doublet
- c) triplet
- d) quartet
- e) dectet

4-7: Consider the following compounds and answer questions 4-7.



4. Which is an **acetal**?

- a b **c** d

5. Which is an **enamine**?

- a b c **d**

6. Which is a **hydrate**?

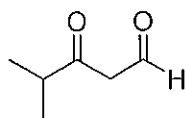
- a **b** c d

7. Which would be in equilibrium with an acyclic form?

- a** b c d

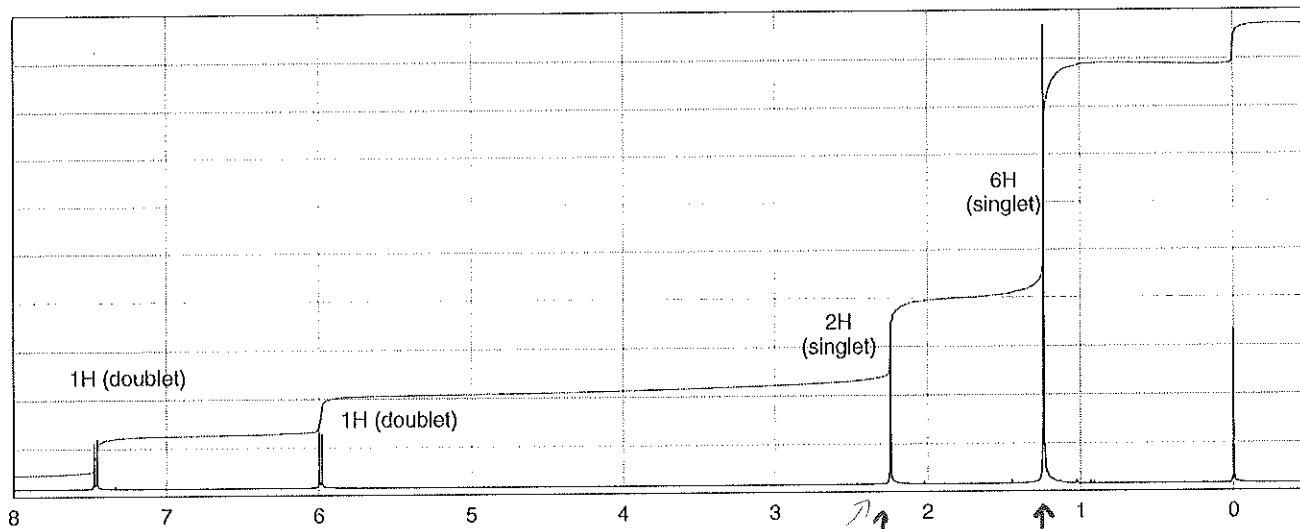
Part II: Short Answer

8. (3 points) a IUPAC name for the following compound:



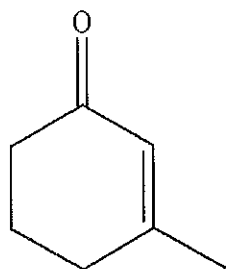
4-methyl-3-oxopentanal

9. (8 points) Which of the following compounds corresponds to this ^1H NMR spectrum? Explain how you ruled out the other possibilities. No credit for just guessing!

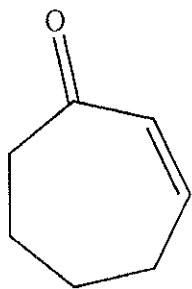


$\text{H} \text{---} \text{C}=\text{C} \text{---} \text{H}$ rules out AD

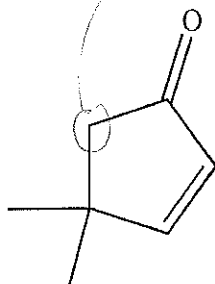
rules out all but C
 2 CH_3 rules out all but C



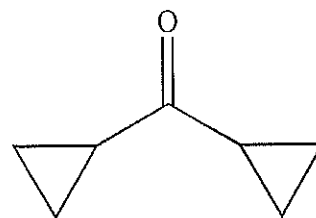
A



B



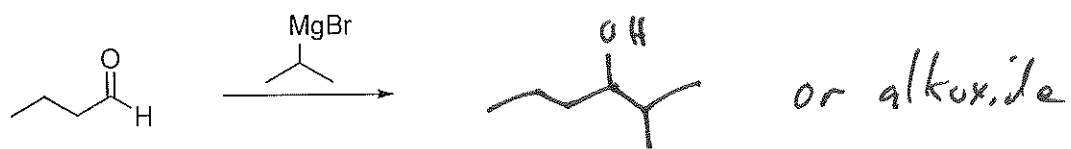
C



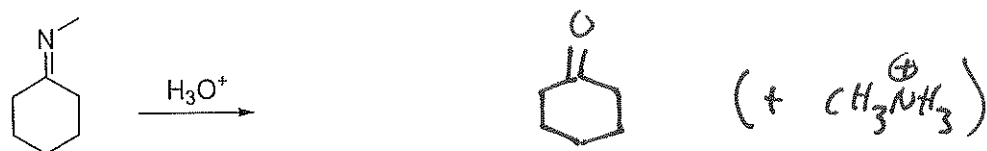
D

10. (28 points) Give the major product(s) for the following reactions:

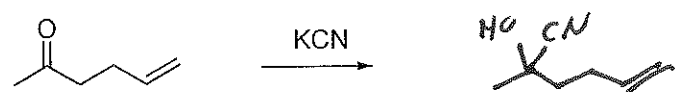
a)



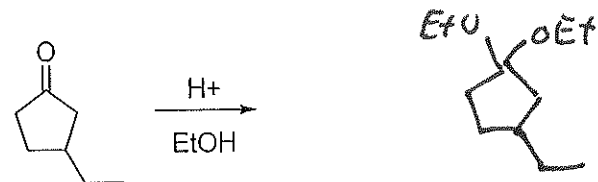
b)



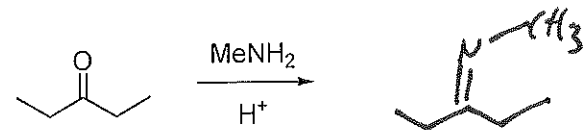
c)



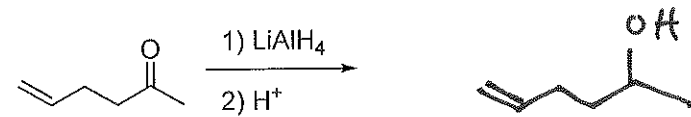
d)



e)



f)

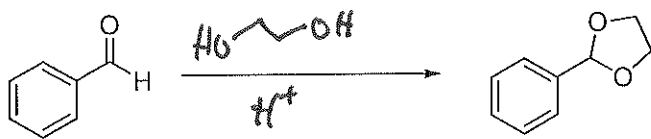


g)

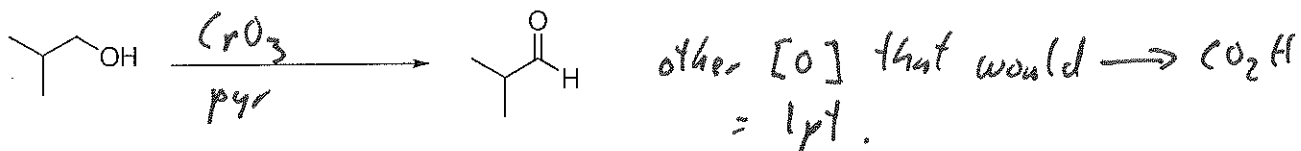


11. (15 points) Provide reagents for the following transformations:

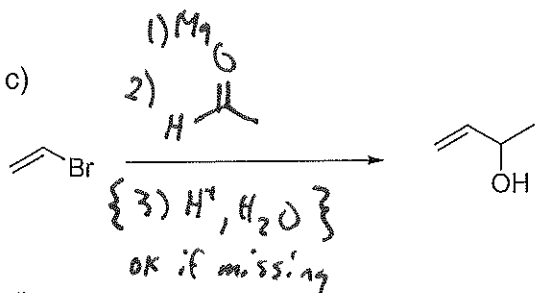
a)



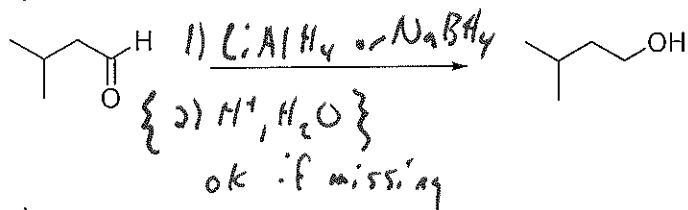
b)



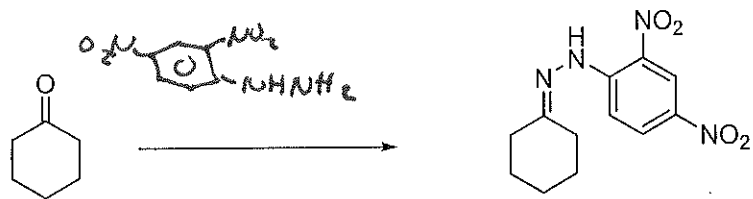
c)



d)

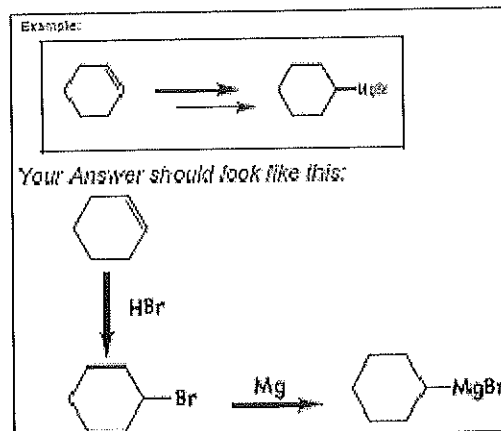


e)

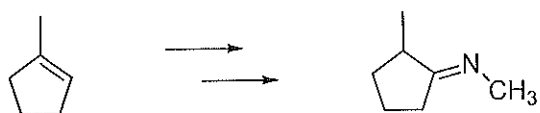


Part III Multistep Synthesis (9 points)

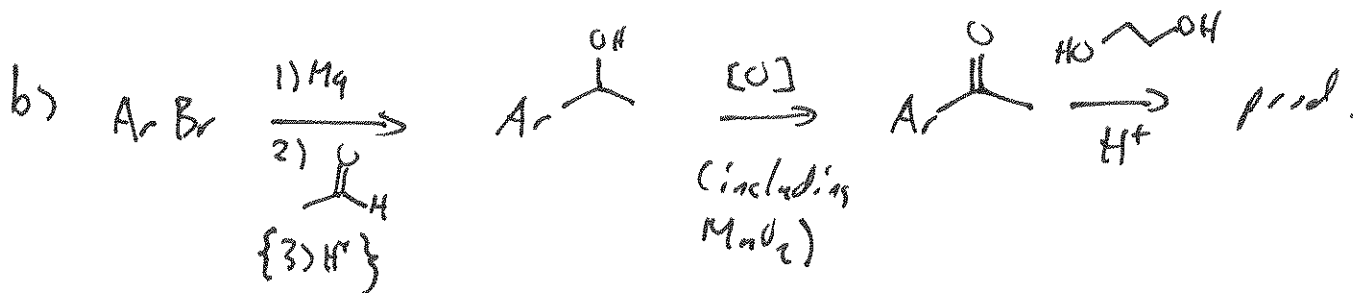
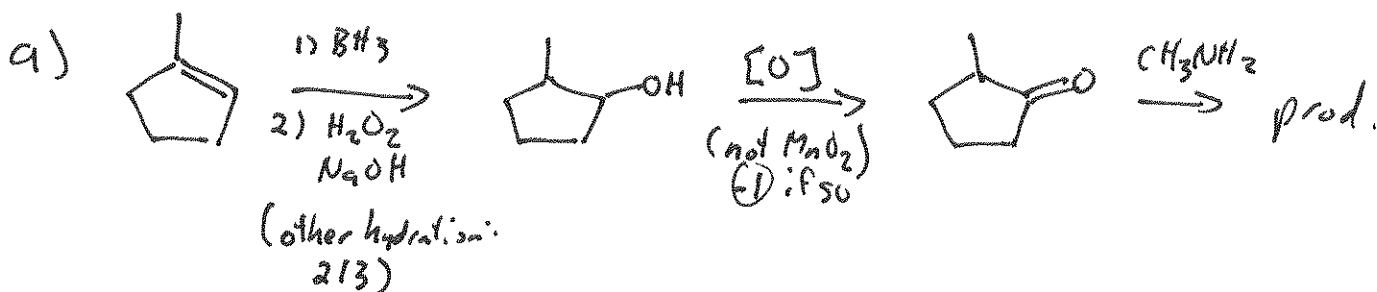
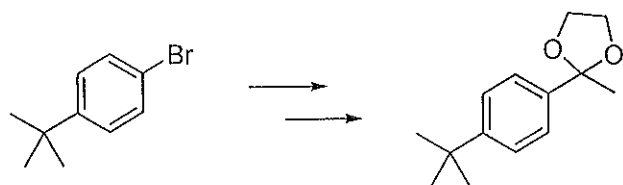
13. Choose one of the two following synthesis problems. Show how you can synthesize the product on the right from the indicated starting material on the left. You can show a retrosynthesis for partial credit, but full credit requires writing out a sequence of forward reactions (see box at right for an example).



a)



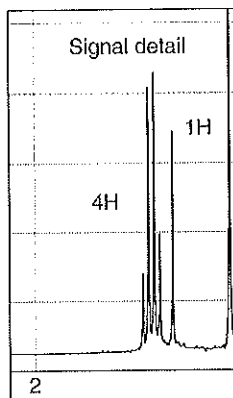
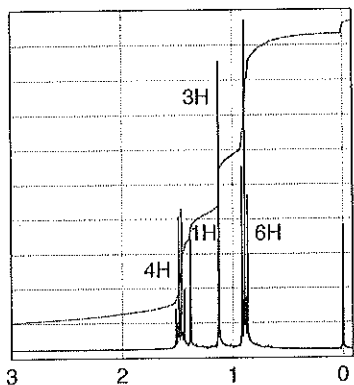
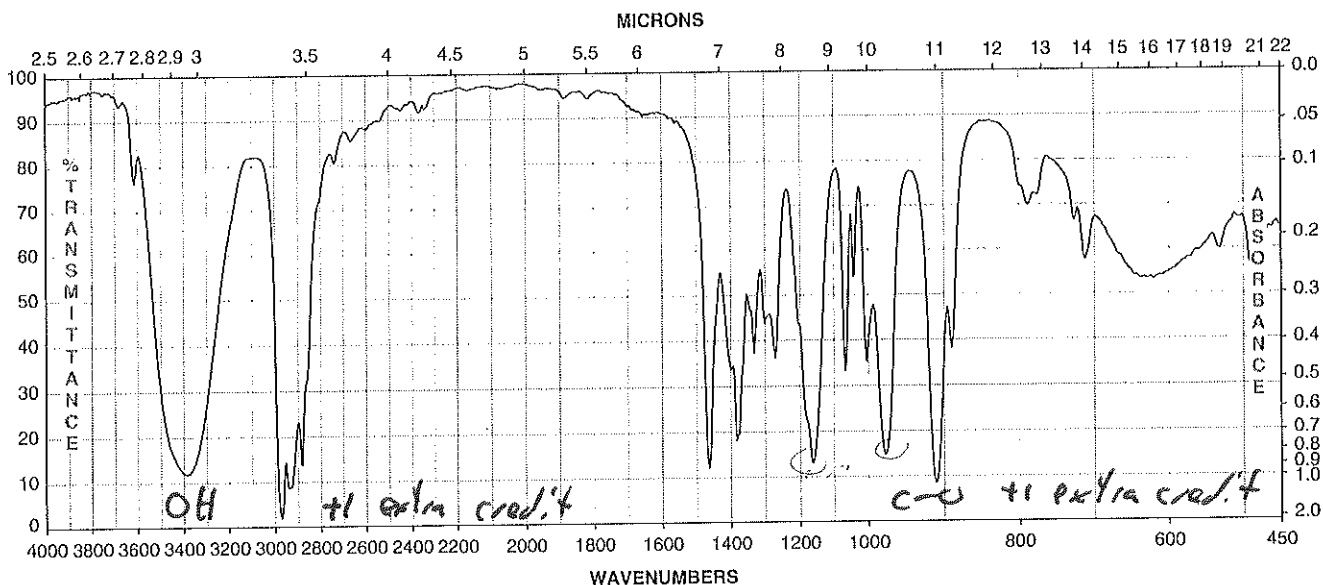
b)



Spectroscopic Analysis of an Unknown Compound (10 points)

O DBE +1 extra credit

14. The IR and ¹H NMR spectra for a compound with the formula C₆H₁₄O are shown below. Identify the structure of the compound. Use the ¹H NMR data to construct a table (chemical shift, integration, multiplicity, assignment) to identify structural fragments, then arrive at the structure. **You are being graded on your analysis.** Any use of the degrees of unsaturation, or IR, will be considered for extra credit



δ	int	mult	assign
1.6	4H	q	2 x X-CH ₂ -CH ₃
1.5	1H	s	O-H
1.2	3H	s	CH ₃ -X
0.9	6H	t	2 x (CH ₃ -CH ₂)

can't be very influential on δ
(2) for assembly
 CH_3CH_2
 CH_2CH_2
 CH_3
 (OH)
 $\text{C}_5\text{H}_{13-14}\text{O}_1$

