Chemistry 234-002
Exam 3 – Version A

Spring 2019 Dr. J. Osbourn

Instructions: Answer the first 18 questions of this exam using the bubble sheet attached to the end of this exam booklet. You may detach this sheet if you wish. Answer the remaining questions directly on this exam. Show all work and provide complete explanations.

The Periodic Table

IA																	VIIIA
1 H 1.01	2 IIA											13 IIIA	14 IVA	15 VA	16 VIA	17 VIIA	2 He 4.00
3 Li 6.94	4 Be 9.01											5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18
11 Na 22.99	12 Mg 24.31	3 IIIB	4 IVB	5 VB	6 VIB	7 VIIB	8	9 VIIIB	10	11 IB	12 IIB	13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95
19 K 39.1	20 Ca 40.08	21 Sc 44.96	22 Ti 47.88	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.39	31 Ga 69.72	32 Ge 72.61	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (98)	44 Ru 101.07	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.76	52 Te 127.6	53 I 126.9	54 Xe 131.29
55 Cs 132.9	56 Ba 137.3	57 La* 138.9	72 Hf 178.5	73 Ta 180.9	74 W 183.9	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197.0	80 Hg 200.6	81 Tl 204.4	82 Pb 207.2	83 Bi 209	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	89 Ac^ (227)	104 Rf (261)	105 Db (262)	106 Sg (263)	107 Bh (264)	108 Hs (265)	109 Mt (268)	110 Ds (271)	111 Rg (272)							

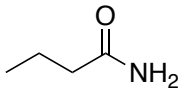
*	58 Ce 140.1	59 Pr 140.9	60 Nd 144.2	61 Pm (145)	62 Sm 150.4	63 Eu 152.0	64 Gd 157.3	65 Tb 158.9	66 Dy 162.5	67 Ho 164.9	68 Er 167.3	69 Tm 168.9	70 Yb 173.0	71 Lu 175.0
^	90 Th 232.0	91 Pa (231)	92 U 238.0	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (260)

Multiple-Choice

Choose the best answer for each of the following questions. Record each answer on the attached bubble sheet. **Ensure you completely bubble in your answers**. *(2 points each)*

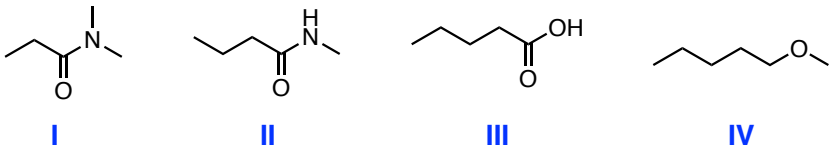
1. What is the common name for the following compound?

   a. butanamide
   b. butyricamide
   c. butyramide
   d. capramide



2. Rank the following from lowest boiling point to highest boiling point.

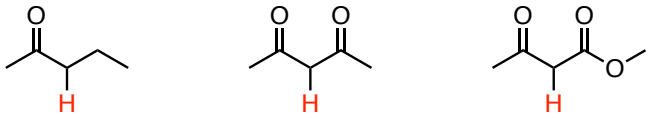
   a. I < IV < II < III
   b. IV < I < II < III
   c. IV < I < III < II
   d. IV < III < II < I
   e. I < II < III < IV



I II III IV

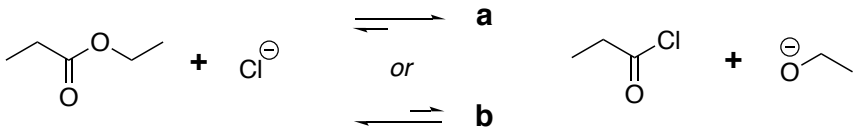
3. Structure ___ is the most acidic while structure ___ is the least acidic.

   a. II, I
   b. II, III
   c. I, III
   d. III, II
   e. III, I

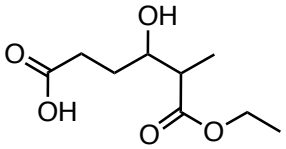


I II III

4. Which set of arrows best describes the following reaction?

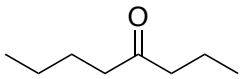


5. Would you expect the following molecule to be water soluble?



   a. Yes – Water Soluble
   b. No – Not Water Soluble

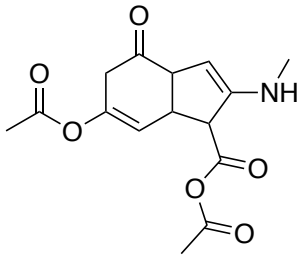
6. Are the kinetic and thermodynamic enolates of the following molecule different?



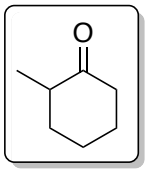
a. Yes – They are Different
b. No – They are Identical

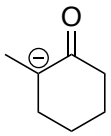
7. How many hydrolyzable functional groups are in the following molecule?

a. Two
b. Three
c. Four
d. Five
e. Six

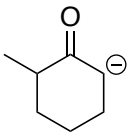


8. Select the resonance structure of the kinetic enolate that is the major contributor to the resonance hybrid.

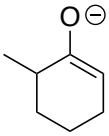




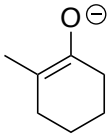
a



b

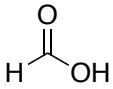


c



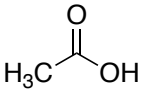
d

9. Which one is the most acidic carboxylic acid?



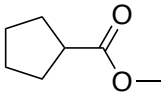
a

vs

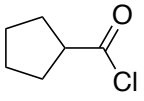


b

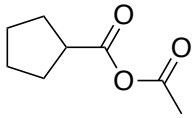
10. Which of the following is the most stable?



a

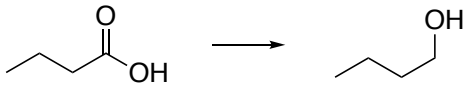


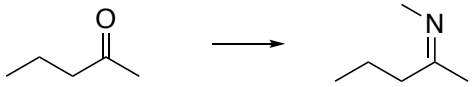
b

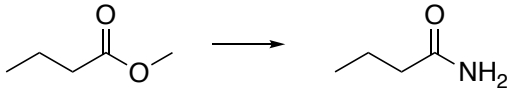


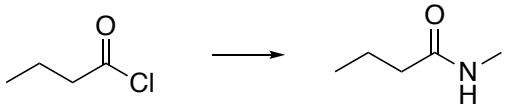
c

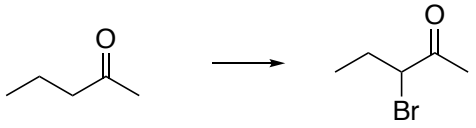
For questions 11-18, choose the best reagent from the reagent bank to accomplish each transformation. Some answer choices require you to bubble in multiple letters. **Bubble each answer in on your bubble sheet for credit!** *(2 points each)*

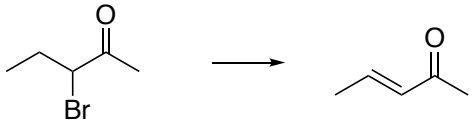
11. 

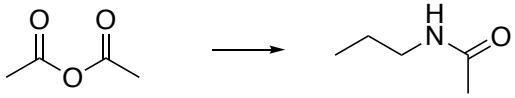
12. 

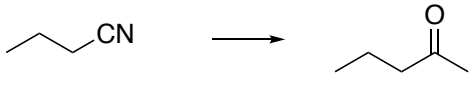
13. 

14. 

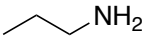
15. 

16. 

17. 

18. 

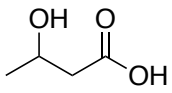
Reagent Bank

Pyridine Heat **a**	H_2N-CH_3 (2 equiv.) **b**	1. BH_3-THF 2. H_3O^+ **c**
Br_2 NaOH **d**	1. CH_3MgBr 2. H^+/H_2O **e**	NH_3 **ab**
$NaNH_2$ **ac**	Br_2 HOAc **ad**	NaOEt HOEt **ae**
 (excess) **bc**	HCl H_2N-CH_3 **bd**	$NaBH_4$ CH_3OH **be**

Completion Section

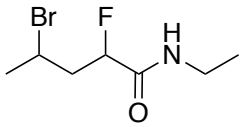
Answer the remaining questions directly on the exam itself. Please write neatly and darkly as your answers will be scanned. **Do not write answers that you want graded on the back pages!**

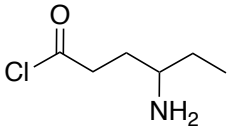
19. Provide the name for each compound shown below. *(3 points each)*

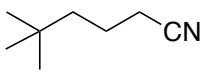
a. 

IUPAC:

Common:

b. 

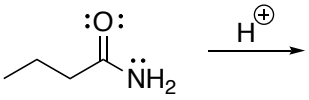
c. 

d. 

20. Draw a representative structure for each of the following. *(1 point each)*

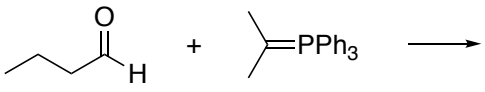
imine	ylide	β-lactone	enolate

21. For the following step, add curved arrows to show electron flow and draw the intermediate that results. *(4 points)*

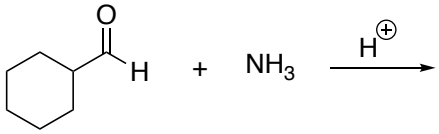


22. Draw the major organic product for each of the following reactions. If the reaction does not proceed under the indicated conditions, write "no reaction." *(2 points each)*

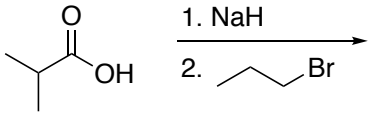
a.



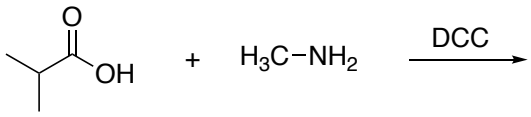
b.



c.

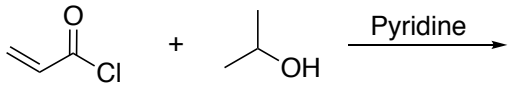


d.

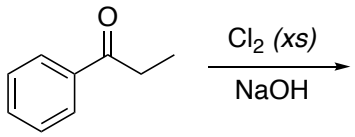


e.

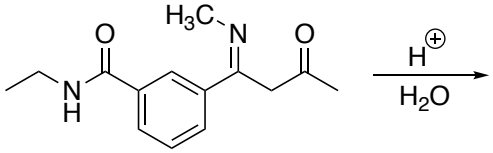
f.



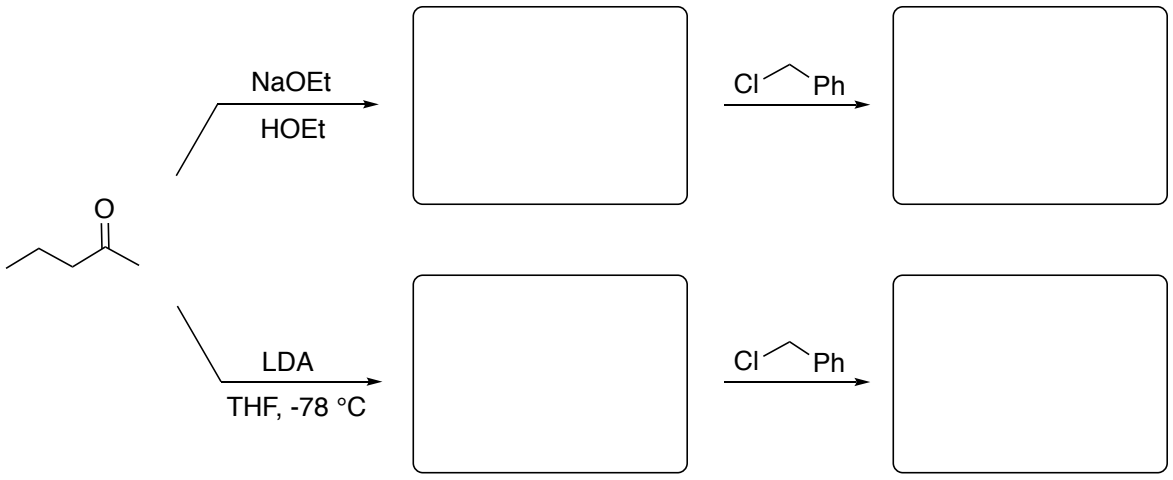
g.



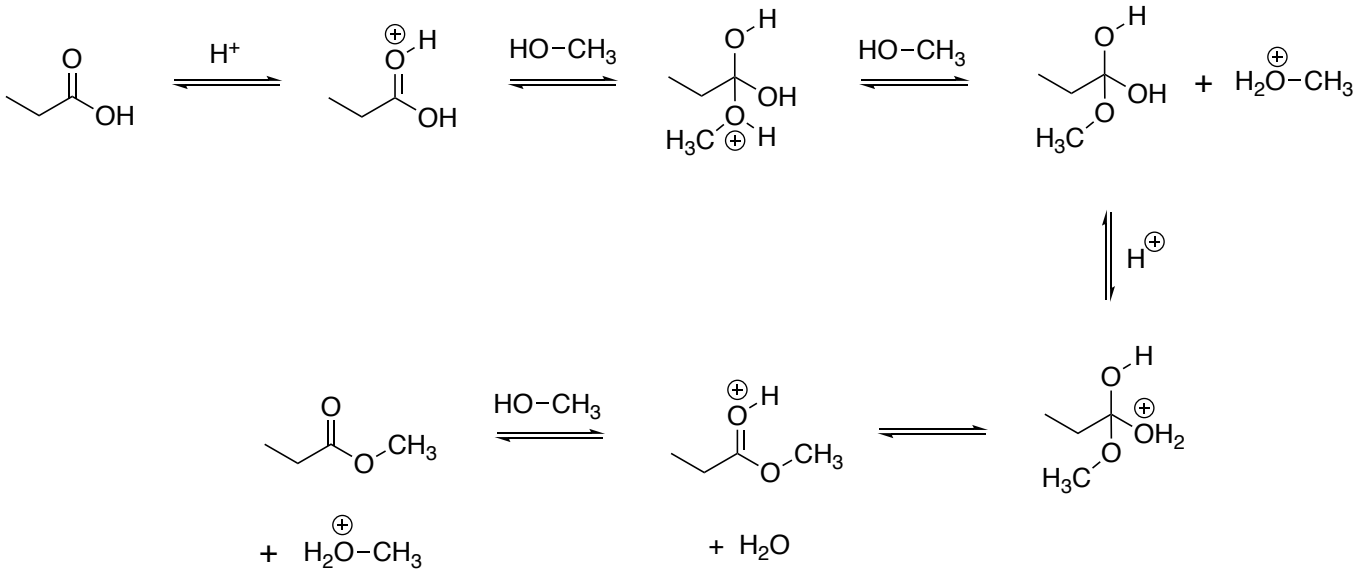
23. Draw the three products that result when the following molecule is subjected to hydrolysis conditions (H^+, H_2O). *(3 points)*



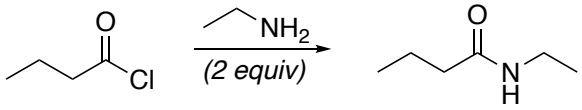
24. Fill in the empty boxes in the following reaction scheme. *(8 points)*



25. The mechanism for the Fischer Esterification is shown below. Draw in curved arrows to show electron flow. Draw in lone pairs as necessary to show the electron pushing. *(6 points)*

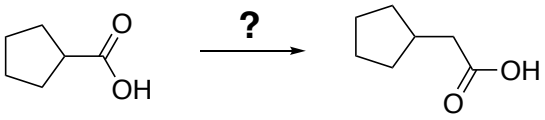


26. Show the complete electron pushing mechanism for the following reaction. *(5 points)*



27. Provide a reasonable synthesis for each of the following using the provided starting material and any other organic or inorganic reagents. *(4 points each)*

a.



b.