

MI

Chemistry 234

Exam 3

Dr. J. Osbourn

Instructions: The first 15 questions of this exam should be answered on the provided Scantron. You must use a pencil for filling in the Scantron sheet. Ensure all erasures are complete. Any questions left blank will be marked incorrect. **Please write and bubble in your student ID number on the scantron.**

Answer the remaining questions on the exam itself. Show all work and provide complete explanations.

The Periodic Table

																		18 VIIIA																			
1 IA																		2 He 4.00																			
1 H 1.01		2 IIA																		13 IIIA		14 IVA		15 VA		16 VIA		17 VIIA		18 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 VIII B		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)																	

****DO NOT REMOVE THIS EXAM COVER PAGE****

Name: _____
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Grading Page: Exam 3

Page	Points Possible	Points Earned
Multiple Choice (3-5)	30	
6	29	
7	22	
8	19	
Total	100	

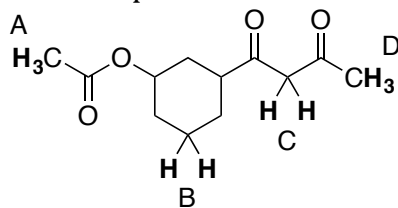
Note: This exam score does not contain your clicker participation bonus points. The participation bonus will be added to the exam score separately. Check e-Campus for you exam grade containing the clicker bonus.

Multiple Choice

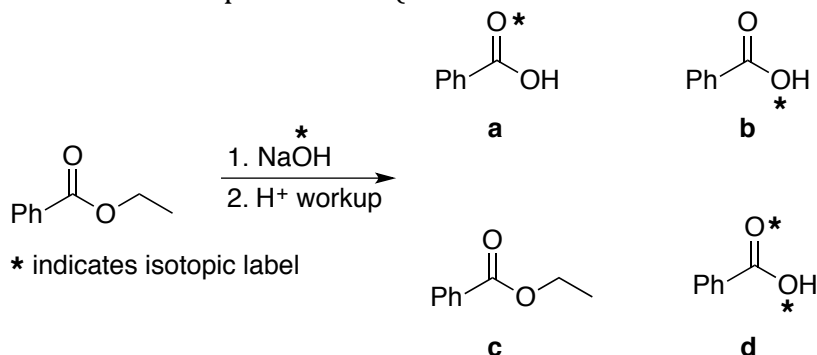
Choose the one best answer for each of the following questions. Bubble your answer in on the provided Scantron sheet. Additionally, circle your answer directly on the exam so that you can check your answers once the key is posted. (2 points each)

- Which one of the following statements is **not** correct regarding enolate formation?
 - Using LDA as the base at -78°C gives irreversible enolate formation.
 - The thermodynamic enolate is the enolate that is more stable.
 - The kinetic enolate is the one that is formed at the slowest rate.
 - Using NaOEt as the base gives the thermodynamic enolate.
 - All of the above statements are correct.

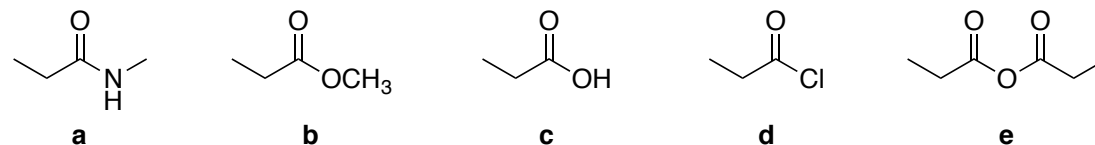
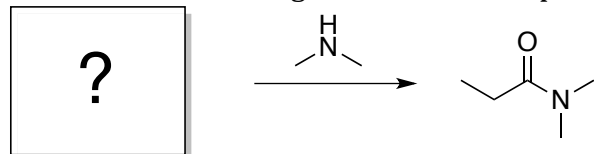
- Rank the protons in the molecule below in order of **increasing** acidity.



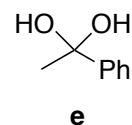
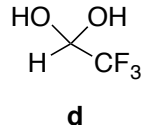
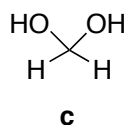
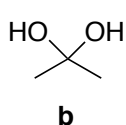
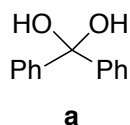
- $B < D < A < C$
 - $A < B < D < C$
 - $B < A < D < C$
 - $C < D < A < B$
 - $A < B < C < D$
- If the ester shown below were saponified with NaOH containing isotopically labeled oxygen, what would the product be? (i.e. where does the O from NaOH end up in the product?)



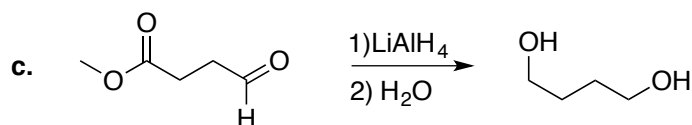
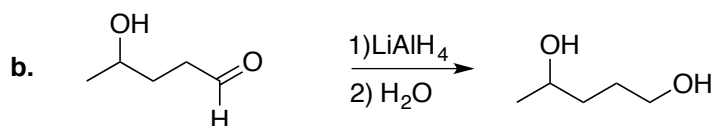
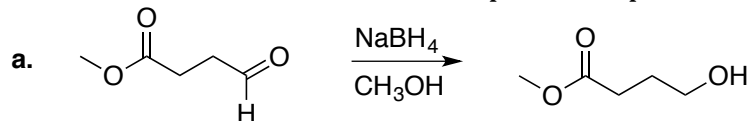
- Which substrate will give the indicated product at the fastest rate?



5. Which one of the following hydrates is the **least stable** (i.e. which one is most likely to revert to the carbonyl species)?



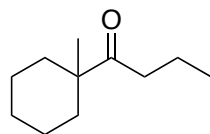
6. Which substrate below needs to be protected prior to the indicated reaction?



d. None of the above need to be protected

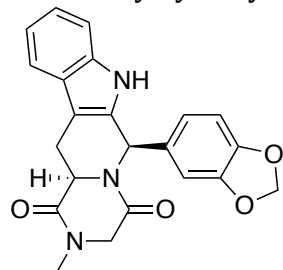
e. Both b and c need to be protected

7. If the molecule shown below were reacted with excess Cl_2 in the presence of NaOH , how many chlorine atoms will be present in the product?



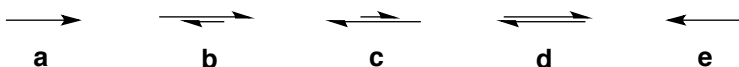
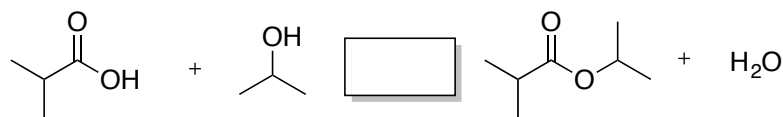
- a. Zero
b. One
c. Two
d. Three
e. Four

8. How many hydrolyzable functional groups are present in the molecule shown below?

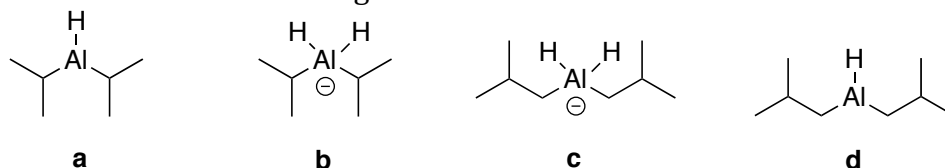


- a. Zero
b. One
c. Two
d. Three
e. Four

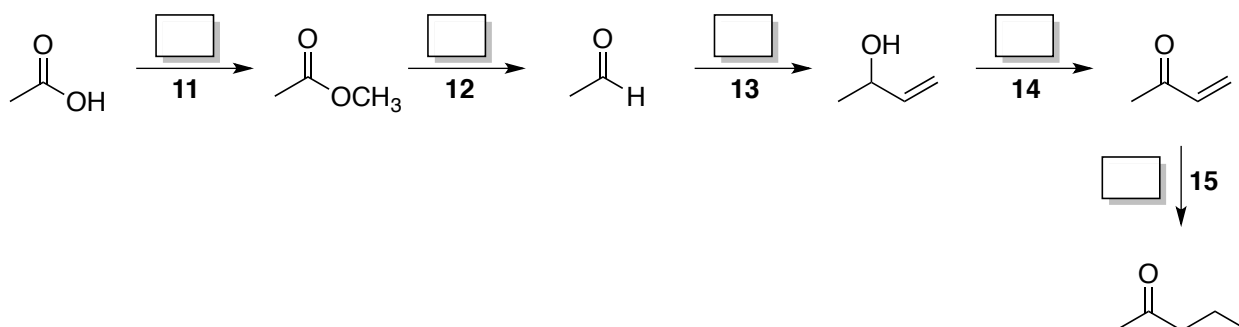
9. Which arrow best describes the reaction shown below?



10. Which one of the following is the structure of DIBAL-H?



For questions 11-15, select the appropriate reagent from the reagent bank to accomplish each step in the synthetic sequence below. *Note that some answers may require you to bubble in more than one letter. Record each answer on your Scranton sheet!*



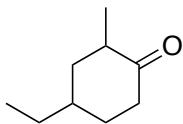
Reagent Bank

1. DIBAL-H -78 °C 2. H ₂ O	1. CH ₃ MgBr 2. H ₃ O ⁺	NaBH ₄ CH ₃ OH	PCC
a	b	c	d
1. (CH ₃) ₂ CuLi 2. H ₂ O	H ₃ O ⁺	H ⁺ HOCH ₃	1. CuLi 2. H ₂ O ²
e	ab	ac	ad
1. MgBr 2. H ₂ O	Ph ₃ P=CH ₂	NaOCH ₃	1. LiAlH ₄ 2. H ₂ O
ae	bc	bd	be

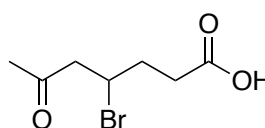
Completion Section: Answer the remaining questions on the exam itself. Read the questions carefully and provide complete explanations. If you have multiple answers written, circle the answer that you want graded.

16. Provide the IUPAC name for each compound shown below. (3 points each)

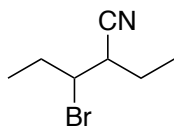
a)



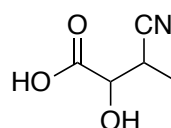
b)



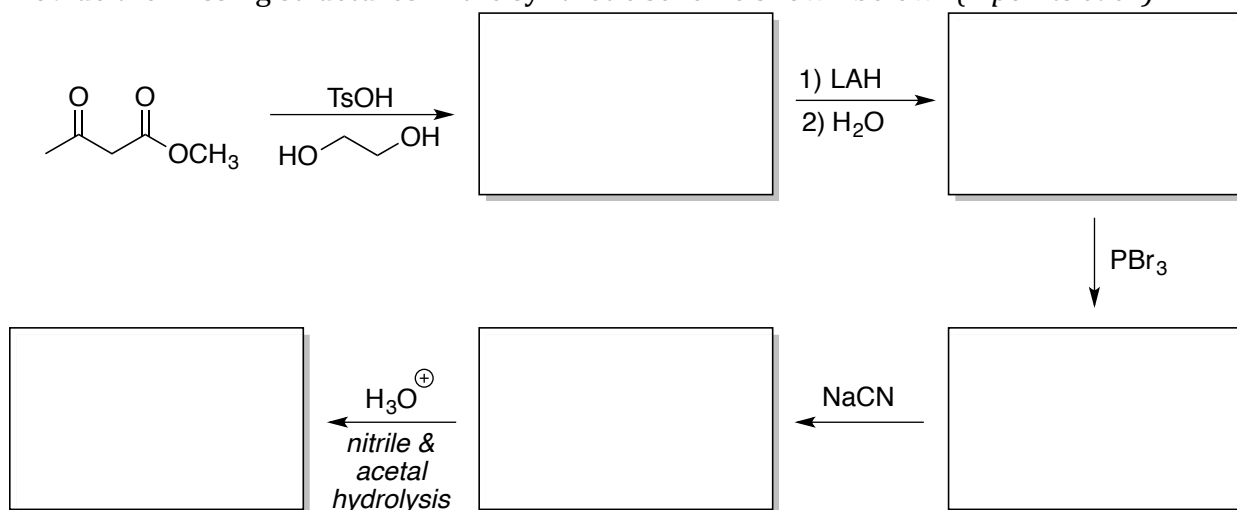
c)



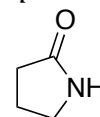
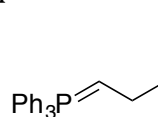
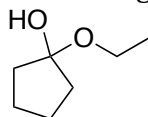
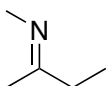
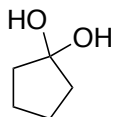
d)



17. Provide the missing structures in the synthetic scheme shown below. (2 points each)

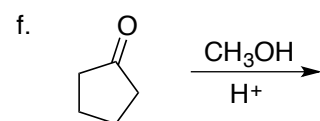
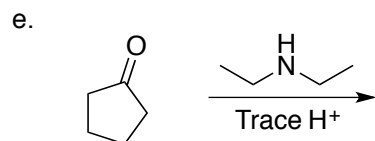
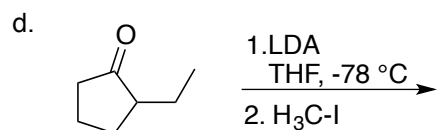
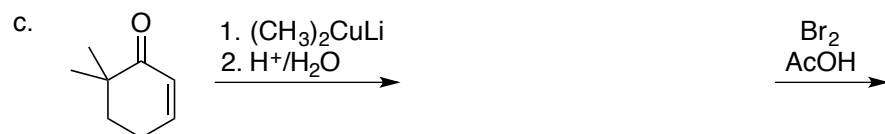
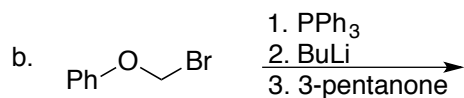
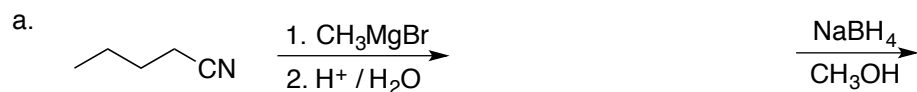


18. Provide a representative name for each functional group or species shown below. (1 pt each)

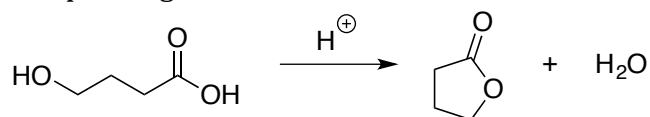


19. Draw the structure of a compound that will react with NaOH/I₂ (excess) to undergo a haloform reaction to produce iodoform. (2 points)

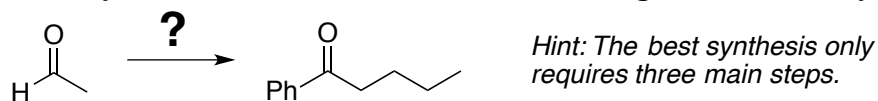
20. Predict the major organic product for each reaction below. If the reaction does not proceed under the specified conditions, write "No Reaction." *Note: some questions have multiple steps associated with them. (2 points each)*



21. Show the complete electron pushing mechanism for the reaction shown below. (6 points)

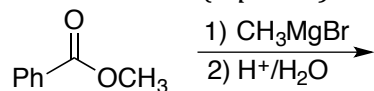


22. Design a reasonable synthesis for the molecule below starting with acetaldehyde. (5 points)



23. Given an unlimited supply of ethanol $\text{CH}_3\text{CH}_2\text{OH}$, show how it can be converted to the necessary molecules to perform a Wittig reaction to obtain 2-butene. Be sure to show all steps and reagents. Ethanol is your only source of carbon atoms. (6 points)

24. Predict the product and provide the complete electron pushing mechanism for the reaction shown below. (6 points)



25. Each molecule below was prepared by reacting an organic molecule with ethyl cuprate. Show the structure of each starting material. (2 points each)

