

# Chemistry 234-002 Exam 2 – Version A

Spring 2019

Dr. J. Osbourn

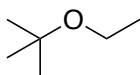
**Instructions:** Answer the first 15 questions of this exam using the bubble sheet attached to the end of this exam booklet. You may detach this sheet if you wish. Answer the remaining questions directly on this exam. Show all work and provide complete explanations.

The Periodic Table																		2	VIII A												
1 H 1.01		2 He 4.00																13 III A	14 IV A	15 V A	16 VI A	17 VII A	18 VIII A								
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)																			
																		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)

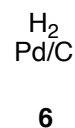
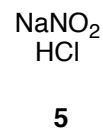
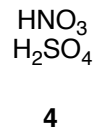
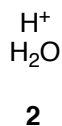
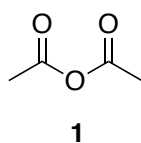
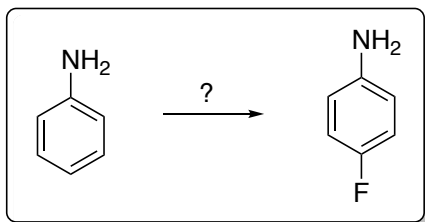
### Multiple-Choice

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)

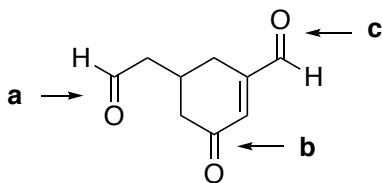
1. What is the common name for the following compound?



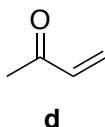
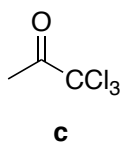
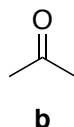
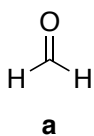
- a. butyl ethyl ether  
b. ethyl t-butyl ether  
c. t-butyl ethyl ether  
d. ethyl t-butyl ester  
e. none of these
2. Which of the following has the reagents in the correct order to carry out the transformation shown?



- a. 1, 4, 6, 5, 3, 2  
b. 4, 6, 1, 5, 3, 2  
c. 1, 5, 4, 6, 3, 2  
d. 1, 5, 4, 6, 2, 3  
e. 3, 1, 4, 6, 5, 2
3. Which of the following carbonyls is the most reactive towards a nucleophile?

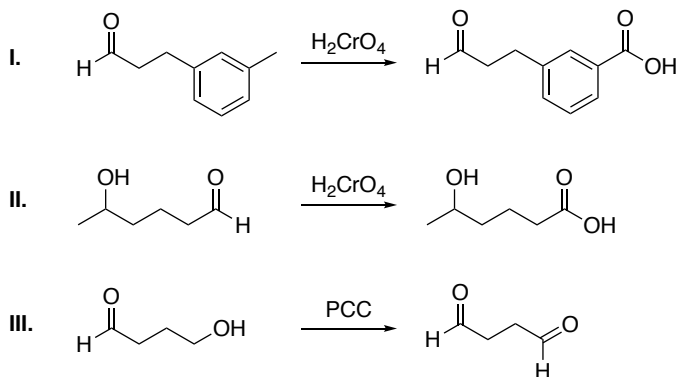


4. Which of the following compounds will give the smallest percentage of hydrate in the presence of water?



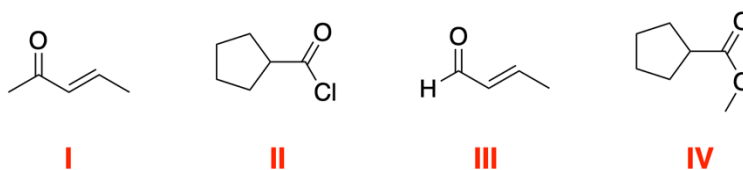
5. Which of the following oxidations will require the use of a protecting group in order to be carried out successfully?

- I only
- I and II
- I and III
- II and III
- I, II, and III



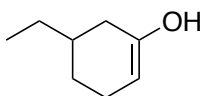
6. Which of the following will give a **ketone** product upon reaction with methyl cuprate ( $\text{Me}_2\text{CuLi}$ )?

- I only
- I and III
- I & II
- I, II, and III
- I, II, III, and IV

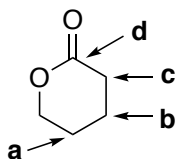


7. How would you best classify the following alcohol?

- Vinyl Alcohol
- Allylic Alcohol
- Primary Alcohol
- Secondary Alcohol
- Tertiary Alcohol

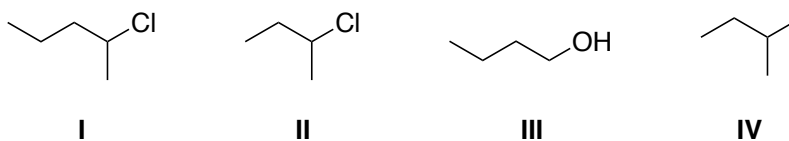


8. Which one of the following is a  $\beta$ -carbon?

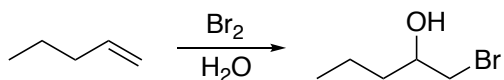


9. Arrange the following compounds from lowest boiling point to highest boiling point.

- $\text{II} < \text{I} < \text{IV} < \text{III}$
- $\text{I} < \text{III} < \text{IV} < \text{II}$
- $\text{IV} < \text{II} < \text{I} < \text{III}$
- $\text{IV} < \text{II} < \text{III} < \text{I}$

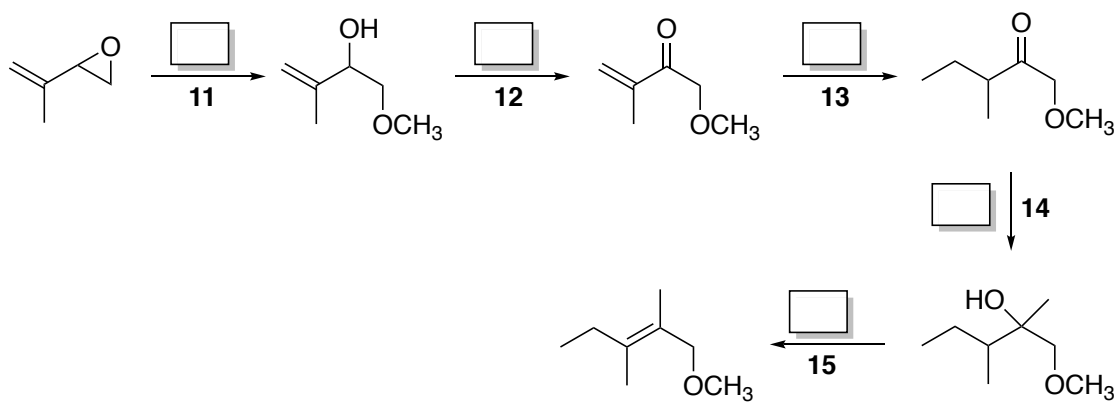


10. Classify the following transformation.



- a. Oxidation
- b. Reduction
- c. Neither

For each transformation in the scheme below, choose the letter (a-d) of the group that contains the appropriate reagent to carry out the desired reaction. **Bubble each answer in on your bubble sheet for credit! (2 points each)**



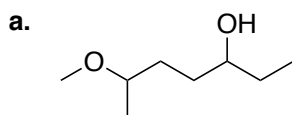
### Reagent Bank

a	b	c	d
1. DIBAL-H -78 °C 2. H <sub>2</sub> O	1. CH <sub>3</sub> MgBr 2. H <sub>3</sub> O <sup>+</sup>	NaBH <sub>4</sub> CH <sub>3</sub> OH	PCC
1. (CH <sub>3</sub> ) <sub>2</sub> CuLi 2. H <sub>2</sub> O	H <sub>3</sub> O <sup>+</sup>	H <sup>+</sup> HOCH <sub>3</sub>	POCl <sub>3</sub> Pyridine
1. LiAlH <sub>4</sub> 2. H <sub>2</sub> O	1. NaOCH <sub>3</sub> 2. Dilute H <sup>+</sup>	TsCl Pyridine	NaCH <sub>3</sub>

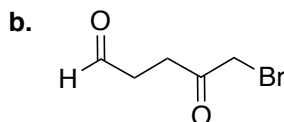
### Completion Section

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!**

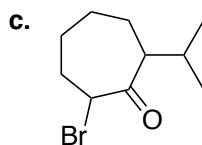
16. Provide the IUPAC name for each compound shown below. (3 points each)



Score



Score



Score

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

Score

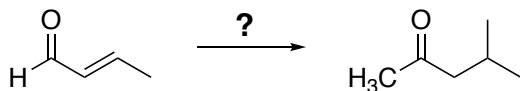
\_\_\_\_\_   
 hemiacetal

\_\_\_\_\_   
 hydrate

\_\_\_\_\_   
  $\alpha,\beta$ -unsaturated   
 aldehyde

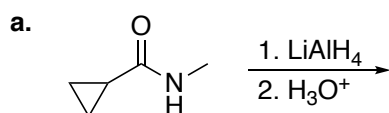
\_\_\_\_\_   
 ethyl cuprate

18. Provide a reasonable synthesis for the compound shown below using the provided starting material and any other organic or inorganic reagents. (4 points)



Score

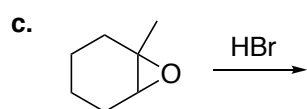
19. Predict the major product(s) for each of the following reactions. If the reaction does not proceed under the indicated conditions, write "no reaction". (2 points each)



Score



Score



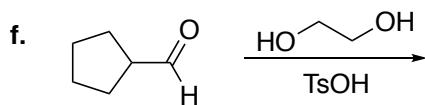
Score



Score

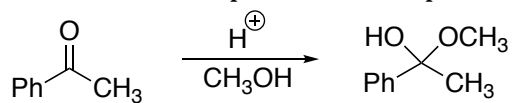


Score



Score

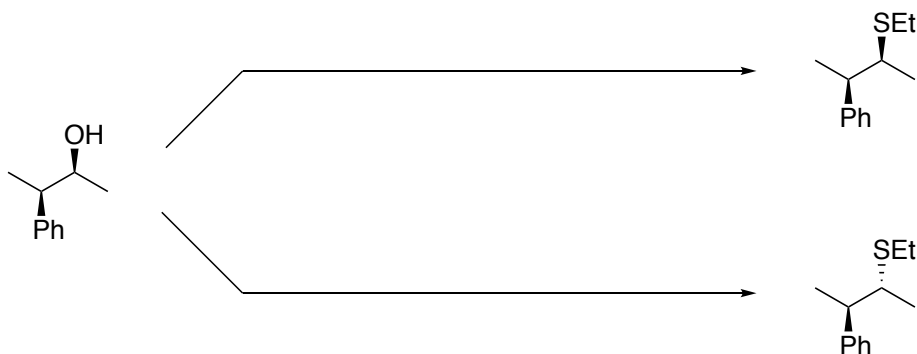
20. Provide the complete electron pushing mechanism for the following reaction. (7 points)



Score

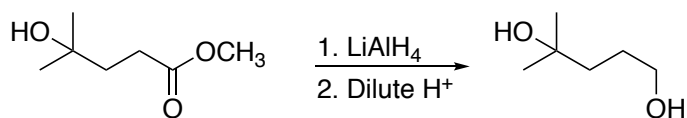
21. Provide the necessary reagents to convert the following chiral alcohol into each of the following stereoisomeric compounds. (4 points)

Score



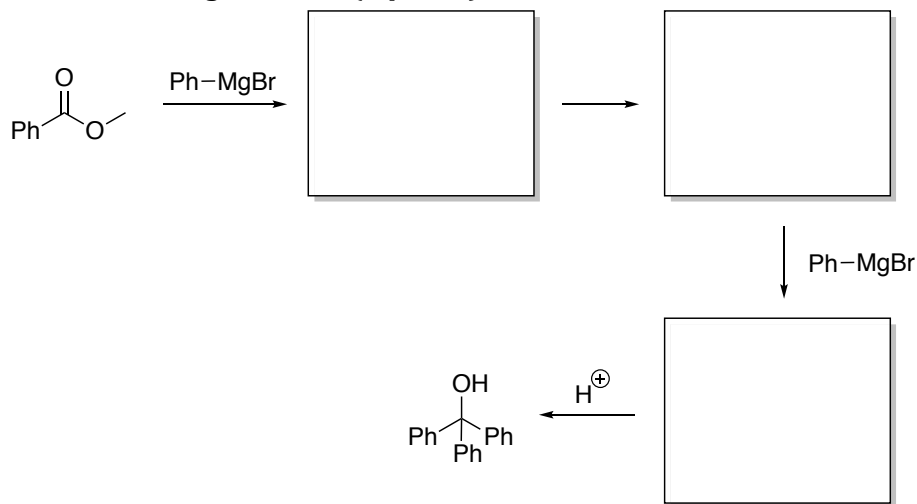
22. The following reaction does not proceed as written. Explain why the desired reaction does not take place. Then, provide an alternative method for preparing the desired product using the given starting material. (5 points)

Score



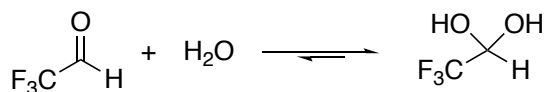
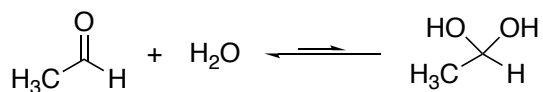
23. Provide the missing intermediates and then add curved arrows to every step to show electron flow in the following reaction. (7 points)

Score



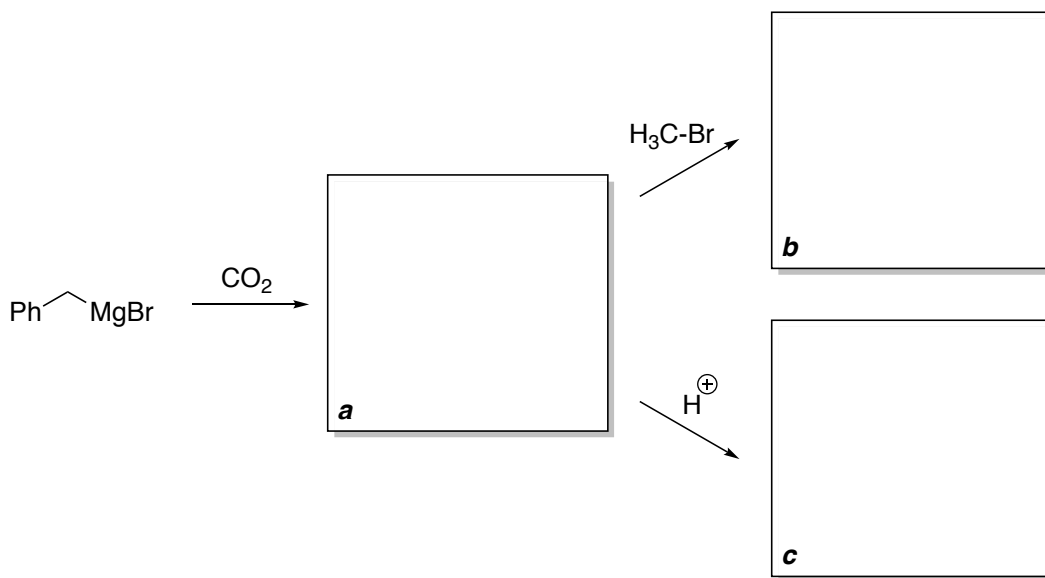
24. Explain why acetaldehyde in the presence of water only gives a very low percentage of hydrate while trifluoroacetaldehyde exists predominately as the hydrate. (4 points)

Score



25. Complete the following reaction scheme. *Note: structure a is a charged intermediate.* (6 points)

Score



26. Provide the two best starting materials to prepare the following ether using the Williamson Ether Synthesis. (2 points)

Score

