

Name:

Last

First

MI

Chemistry 234
Exam 3 (Green)

Summer 2018

Dr. J. Osbourn

Instructions: The first 11 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. Answer the remaining questions on the exam itself. Show all work and provide complete explanations.

Please write your name on:

- **The first page (Exam Cover Page)**
- **The second page (Grading Page)**
- **The Scantron Sheet** – Circle your Last Name

Please bubble in your WVU Student ID Number on your Scantron sheet.

The Periodic Table

[illegible]

Please do not rip off this cover sheet

Name: _____
Last First MI

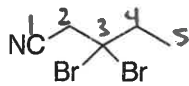
Grading Page (Exam 3):

Page	Points Possible	Points Earned
Multiple Choice (3-4)	22	
5	22	
6	31	
7	25	
TOTAL	100	

Multiple-Choice

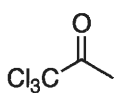
Reach each question carefully. Record your answers on your Scantron sheet. Additionally, circle/write each answer directly on this exam. (2 points each)

1. What is the IUPAC name for the following molecule?

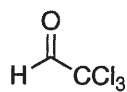


- a. 3,3-dibromobutanenitrile
- ☒ b. 3,3-dibromopentanenitrile
- c. 2,2-dibromo-1-cyanobutane
- d. 3,3-dibromopentanitrile

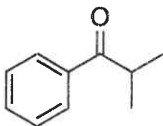
2. Which compound will give the largest percentage of hydrate at equilibrium?



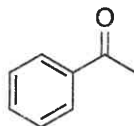
a



☒ b

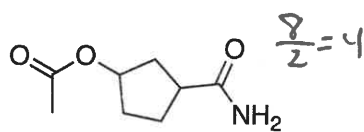


c

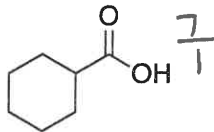


d

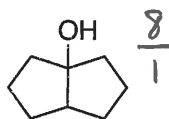
3. Which of the following do you expect to be water-soluble? Bubble in the letter for all that apply!



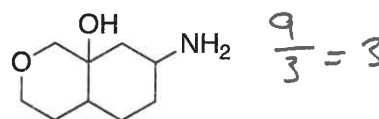
☒ a



b

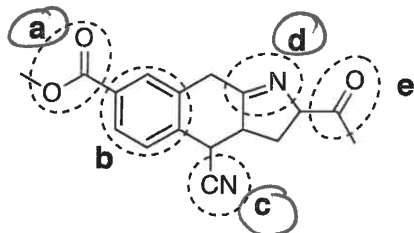


c

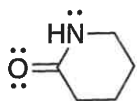


☒ d

4. Which of the circled functional groups will undergo hydrolysis when subjected to H^+/H_2O ? Bubble in the letter for all that apply!



5. If the amide below is reacted with a strong acid, which atom would be selectively protonated?



- ☒ a. The oxygen
- b. The nitrogen

6. Which one of the following carbonyl compounds is the least stable?



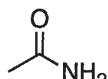
a



☒ b



c



d

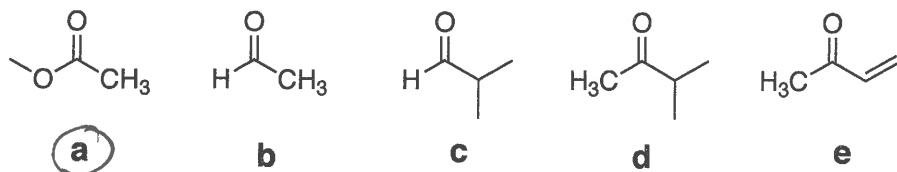


e

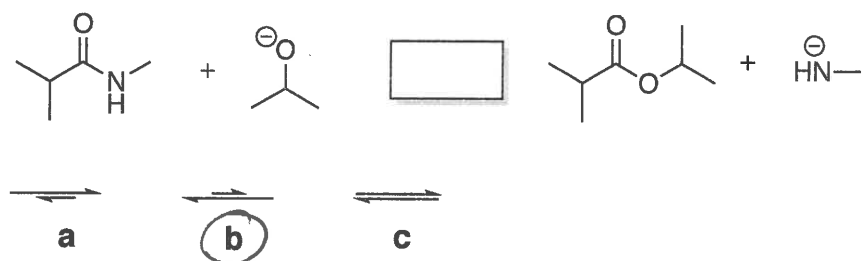
7. What is the driving force for the base mediated amide hydrolysis?

- a. Formation of the more stable carboxylic acid.
- b. An acid base reaction between the carboxylic acid that forms and the amide (R_2N^-) anion.**
- c. Loss of water
- d. Protonation of the amine by the acid to give an ammonium salt.
- e. None of the above

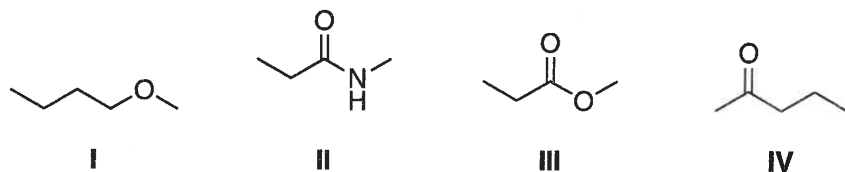
8. Which one of the indicated carbonyls is the least reactive toward a nucleophile?



9. Which arrow best describes the reaction shown below?



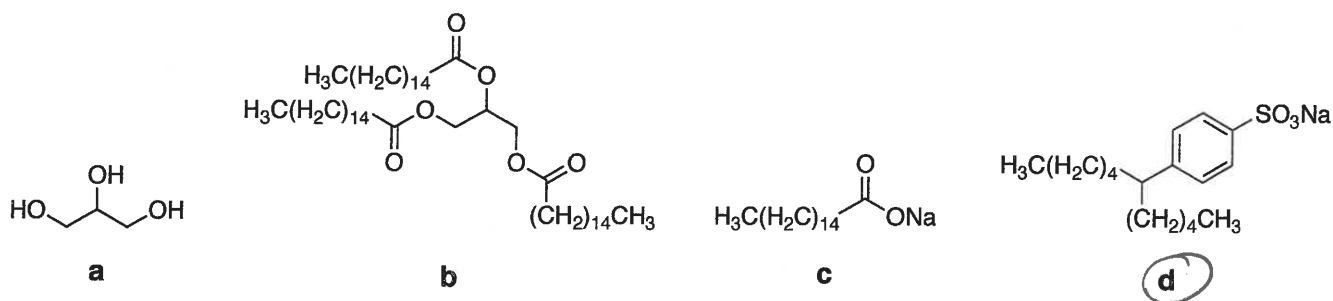
10. Rank the compounds shown below in order of increasing boiling point.



- a. $IV < I < III < II$
- b. $I < III < II < IV$
- c. $I < III < IV < II$**
- d. $I < IV < III < II$
- e. None of the above are correct

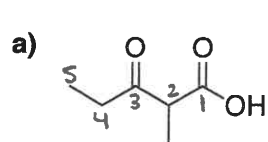
$I < III < IV < II$

11. Which one of the following represents a detergent?



Completion Section: Answer the remaining questions on the exam itself. Read the questions carefully and provide complete explanations.

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

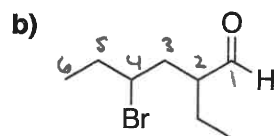


2-methyl-3-oxopentanoic acid

(+1) Correct parent

(+1) Correct #

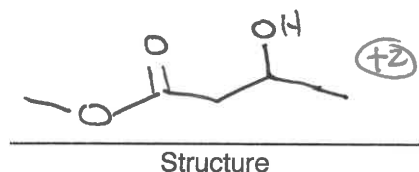
(+1) Correct substituents in abc order



4-bromo-2-ethylhexanal

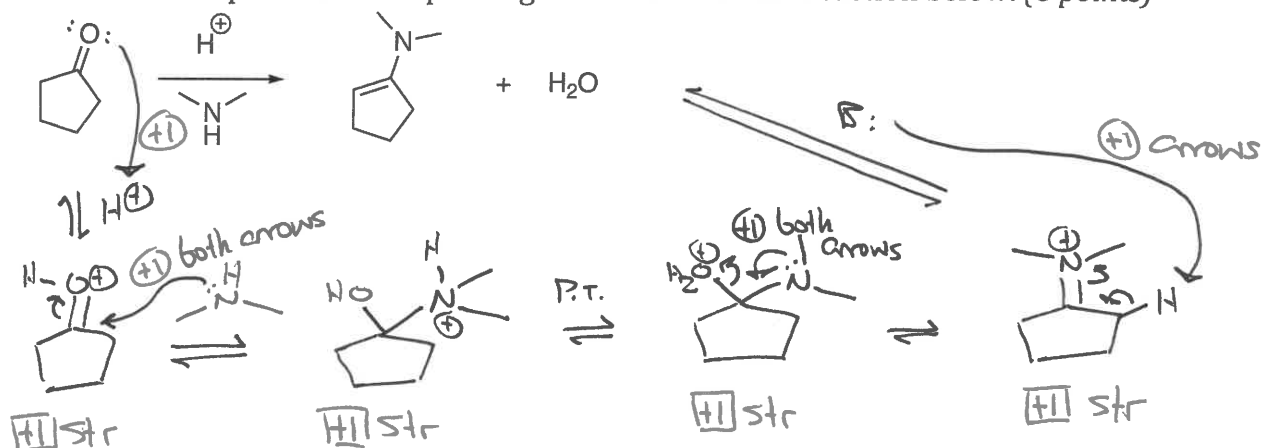
Same as ↗

(4) 13. Draw the structure for **methyl 3-hydroxybutanoate** and then write the common name for this molecule. (4 points)

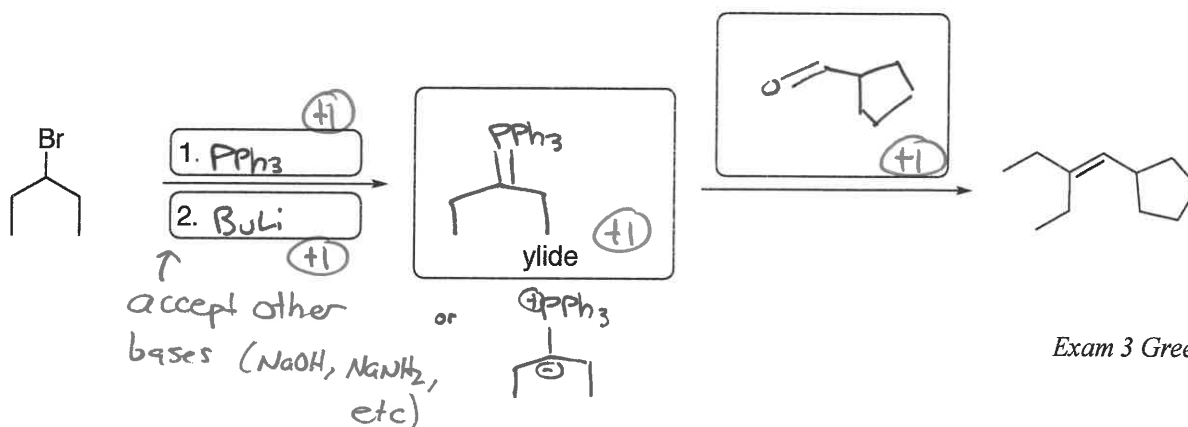


(+0.5) (+0.5) (+1)
methyl β-hydroxybutyrate
Common Name

14. Show the complete electron pushing mechanism for the reaction below. (8 points)

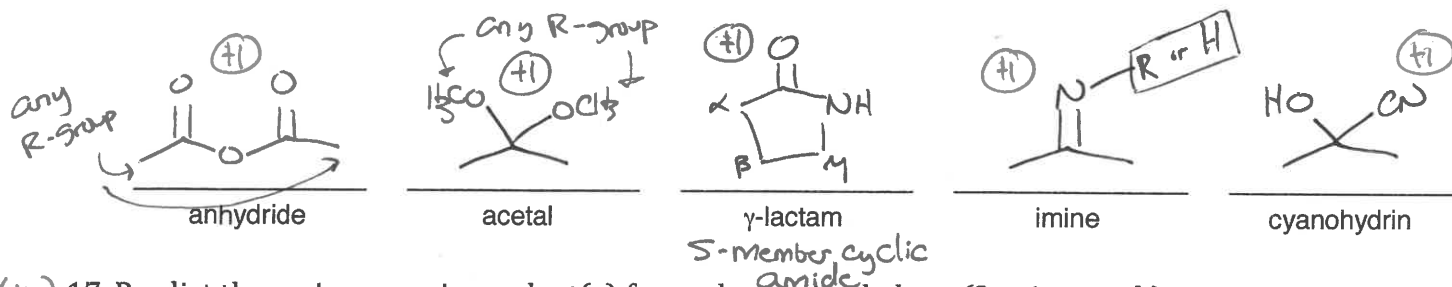


15. Show how the following alkene can be prepared via a Wittig reaction by filling in the boxes with the appropriate structures or reagents. (4 points)

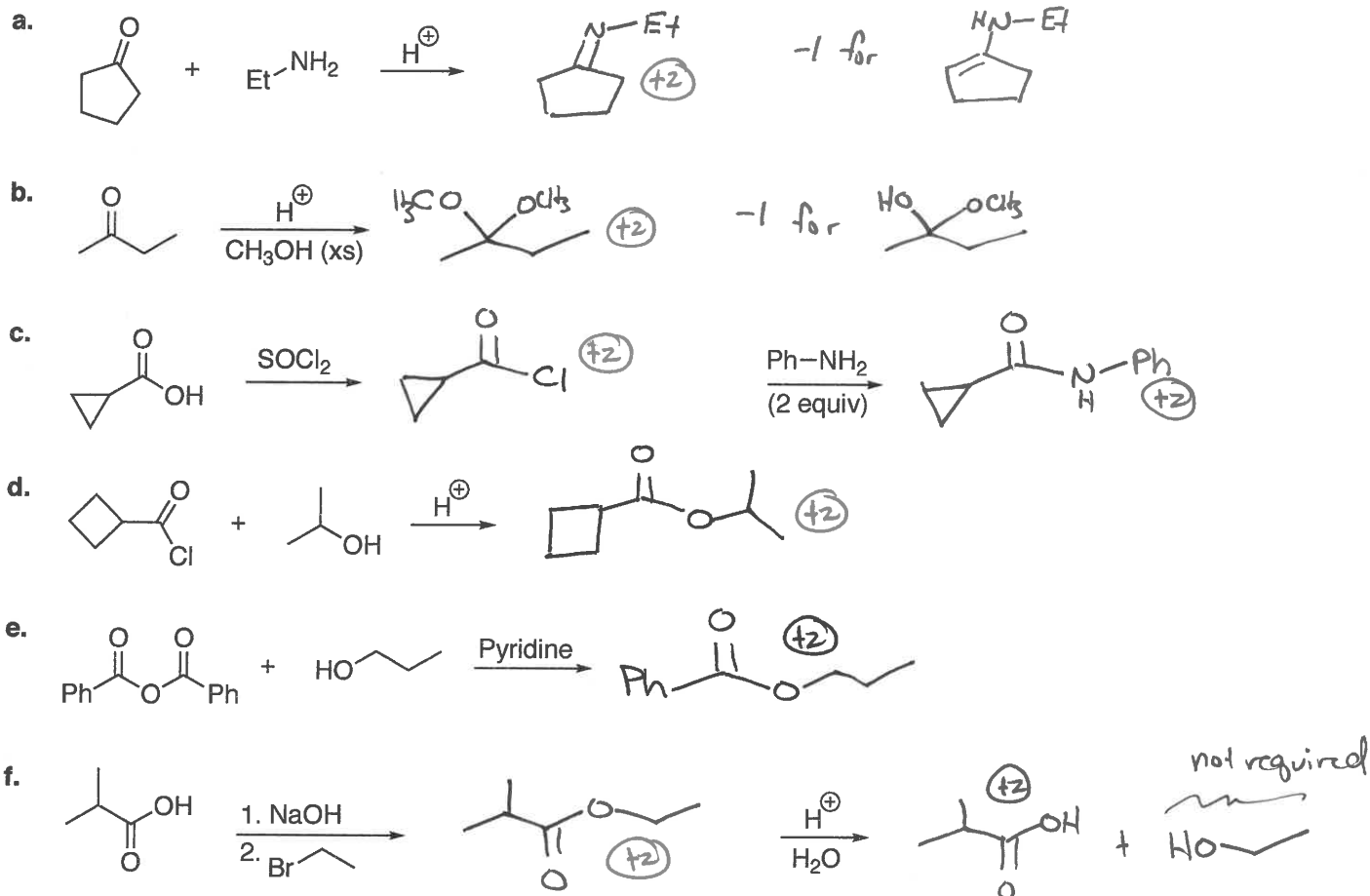


Green

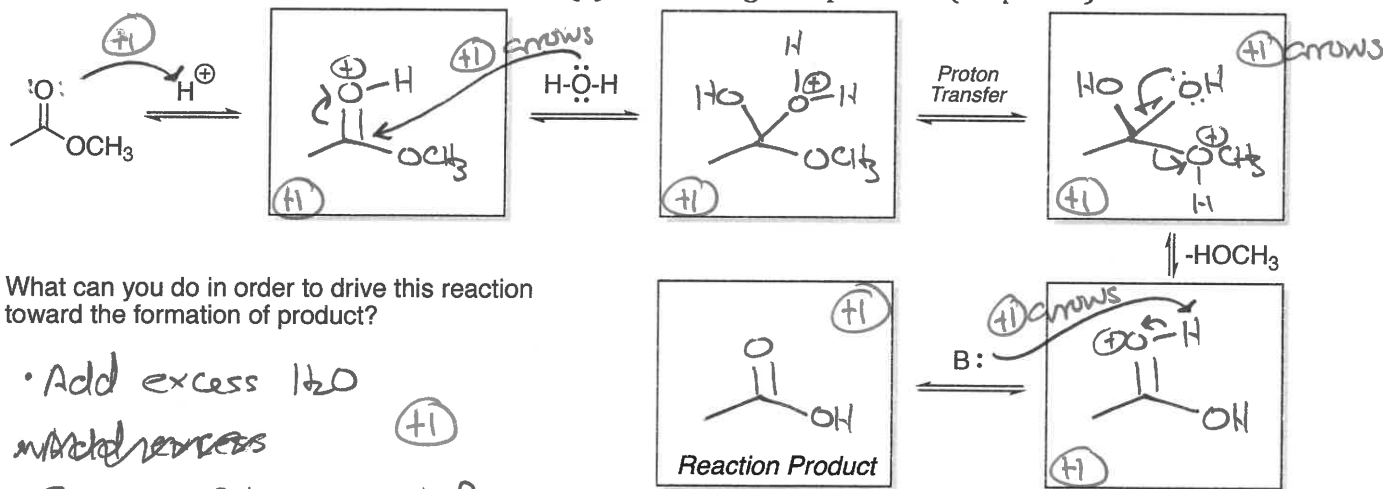
(S) 16. Draw a representative structure for each of the following. (1 point each)



(16) 17. Predict the major organic product(s) for each reaction below. (2 points each)

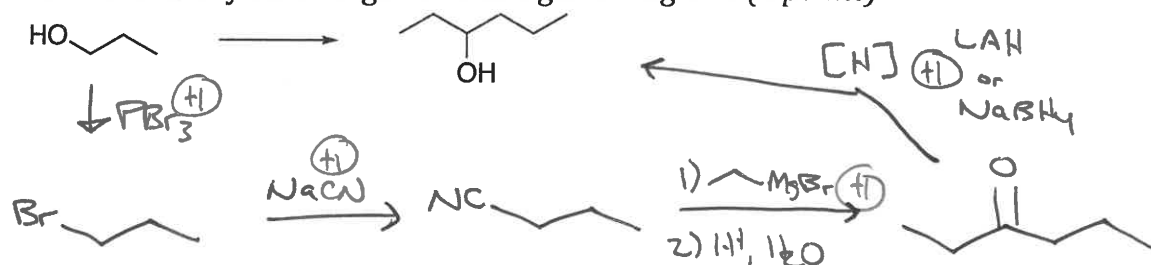


(10) 18. Complete the electron pushing mechanism by (a) filling in the missing boxes, (b) drawing in curved arrows to show electron flow, and (c) answering the question. (10 points)



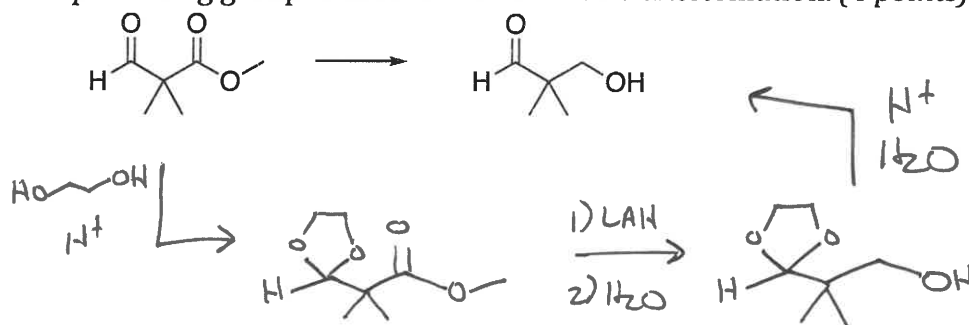
Green

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



-2 if they have correct reagents, but wrong order

- (4) 20. An aldehyde is more reactive toward a reducing agent than an ester. For this reason, the following ester can't be selectively reduced by reacting with LAH. Explain (show) how you can make use of a protecting group to achieve the desired transformation. (4 points)

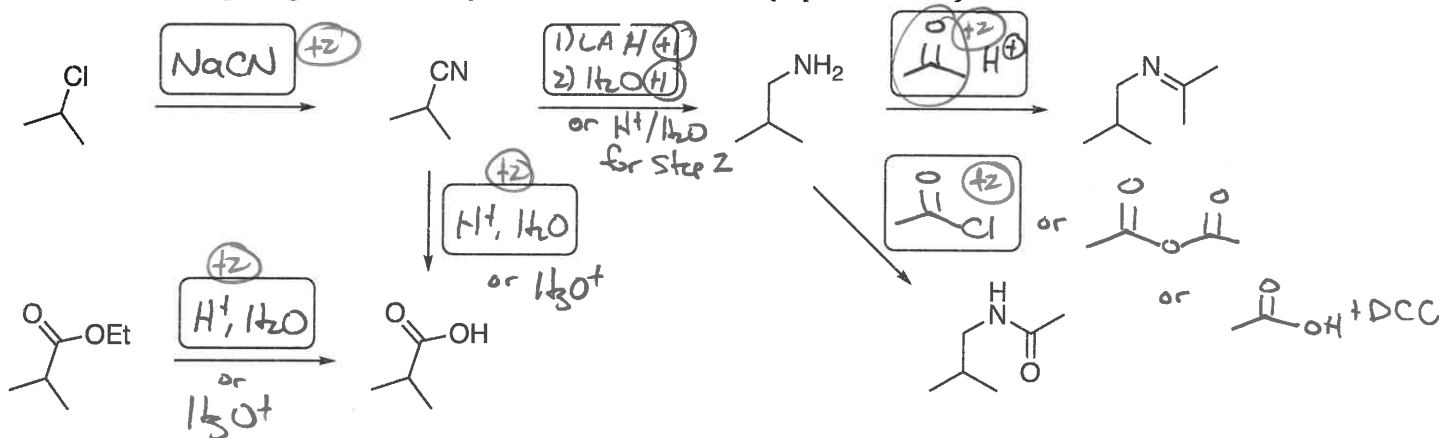


(+4) for showing correct protection/deprotection sequence.

- (2) 21. What is the product upon hydrolysis of the following hemiacetal? (2 points)



- (12) 22. Fill in the missing reagents in the synthetic scheme below. (2 points each)



- (3) 23. Draw the structure of the dipeptide that is formed by the DCC coupling of Boc-protected valine and MOM-protected alanine. (3 points)

