

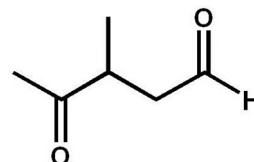
## Organic Chemistry (2nd semester)

Third term examination (Friday, Jun. 4th, 2021, 8:00 ~ 10:10)

Name: \_\_\_\_\_ ; Student ID number: \_\_\_\_\_ ; Score: \_\_\_\_\_/350

1. What is the systematic name of the following compound? (4 point)

- (A) 3-methyl-4-oxopentanal  
 (B) 3-methyl-2-oxopentanal  
 (C) 3-methyl-2-oxo-5-pentanal  
 (D) 3-methyl-5-oxo-2-pentanone  
 (E) 3-methylpentan-5-one-1-al

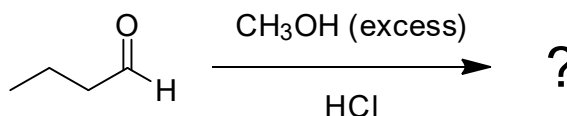


2. Which is the correct order of decreasing acidity (increasing pKa)? (4 point)

- (a) (b) (c) (d)  $\text{CH}_3\text{CH}_2\text{CN}$  (e)

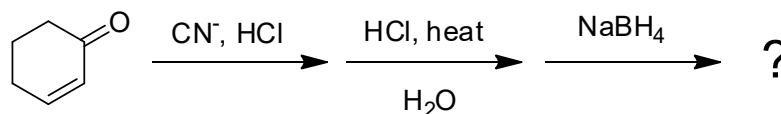
- (A)  $e > c > d > b > a$  (B)  $c > e > b > a > d$  (C)  $e > c > b > a > d$   
 (D)  $c > e > a > b > d$  (E)  $e > d > c > b > a$

3. What is the product of the following reaction? (4 point)



- (A) (B) (C) (D) (E) No reaction

4. What is the product of the following sequence of reactions? (4 point)



- (A) (B) (C) (D) (E)

5. After heated ( $\sim 160^\circ\text{C}$ ), which of the following compounds will generate  $\text{CO}_2$ ?

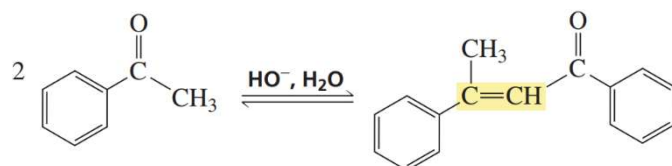
(more than one correct answers) (10 point)

- (A) (B) (C) (D) (E)  $\text{NaHCO}_3$

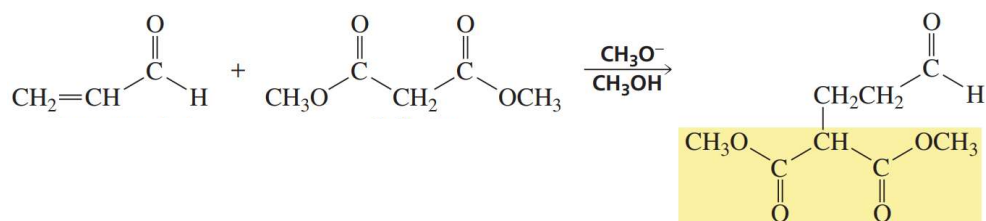
6. Indicate the name to the following reaction. (4 point each)

- (1) Wittig reaction (2) Aldol condensation (3) Hell-Volhard-Zelinski reaction  
(4) Claisen condensation (5) Micheal addition

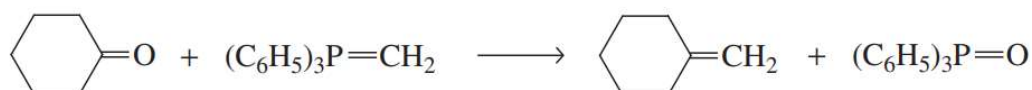
(a)



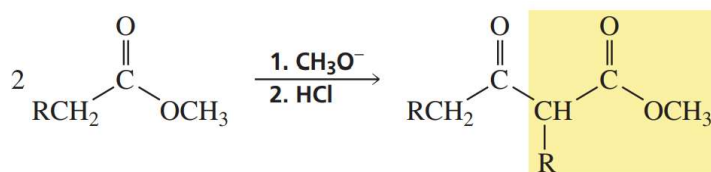
(b)



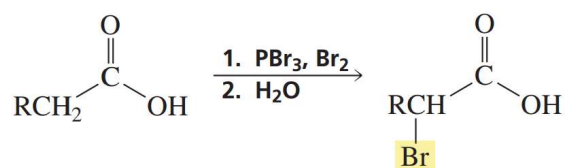
(c)



(d)

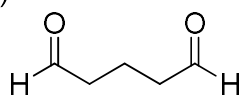


(e)

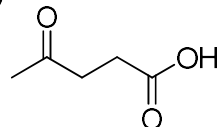


7. Give **systematic names** to the following compounds. (4 point each)

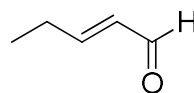
(a)



(b)



(c)



8. Give structures to the following compounds. (4 point each)

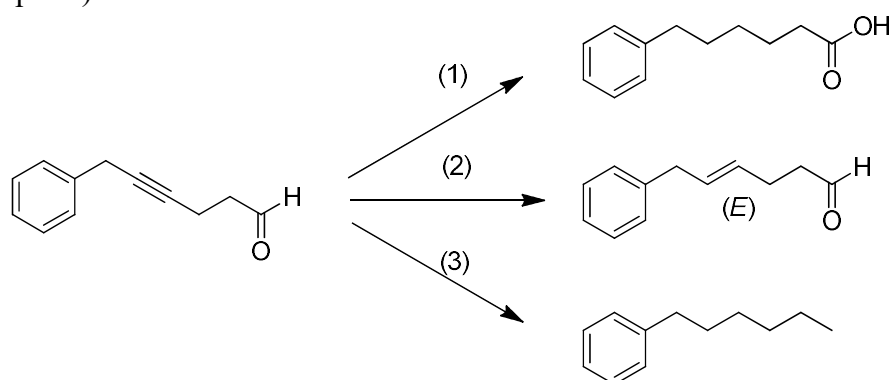
(a) 4-methoxyheptanal

(b) 3-formylpentanamide

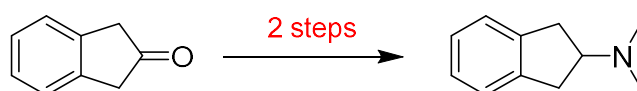
(c) 3-methylcyclohexane carbaldehyde

9. Design a multi-step synthesis to show how each compounds could be prepared from the given starting material. Show all necessary reagent(s) and also **intermediate(s)**.

(a) (15 point)



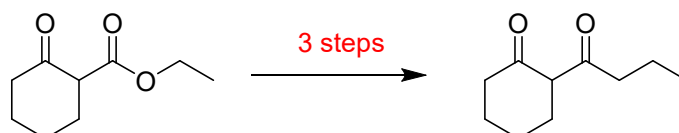
(b) (10 point)



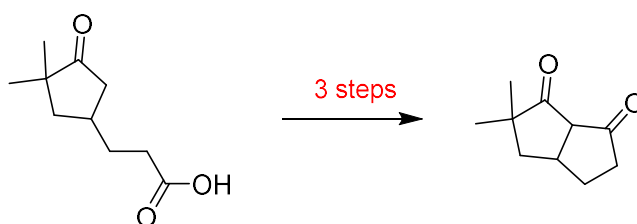
(c) provide the structure and usage of TBDMS, then finish the following synthesis (20 point)



(d) (15 point)

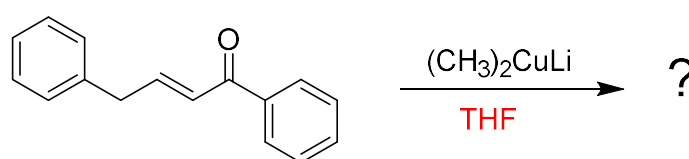


(e) hint: activate carboxylic acid first (15 point)

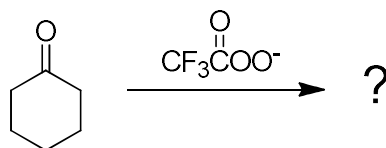


10. Complete each of following reactions by providing **major product**.

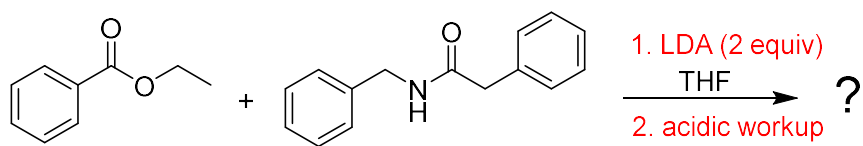
(a) (10 point)



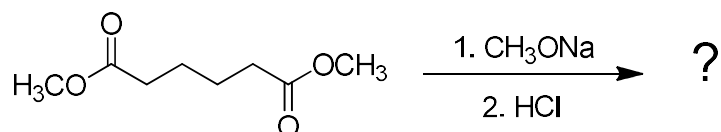
(b) (10 point)



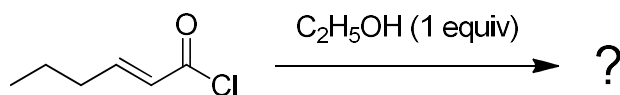
(c) (10 point)



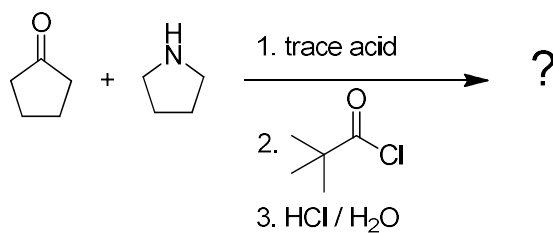
(d) (10 point)



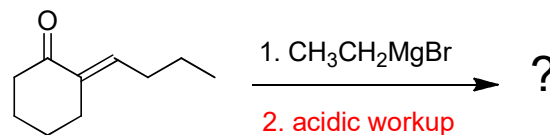
(e) (10 point)



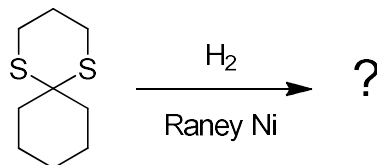
(f) (10 point)



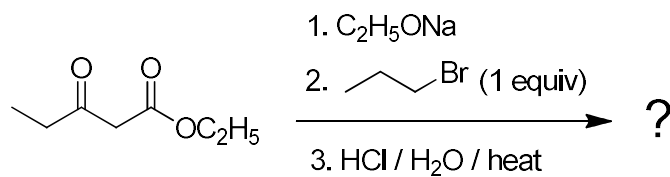
(g) (10 point)



(h) (10 point)



(i) (10 point)



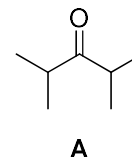
11. Give an example for each of the following type of compounds. (5 point each)

(a)  $\alpha$ -keto amide (b)  $\beta$ -diester

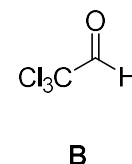
12. Rank the reactivity for following reductant, and give some examples to explain the chemoselectivity order. (15 point)

(a)  $\text{NaBH}_4$  (b)  $\text{LiAlH}_4$  (c)  $\text{LiAl}(\text{OC}(\text{CH}_3)_3)_3\text{H}$

13. Design two different pathways to synthesize compound **A**, noted that all starting material should less than four carbon. (20 point)

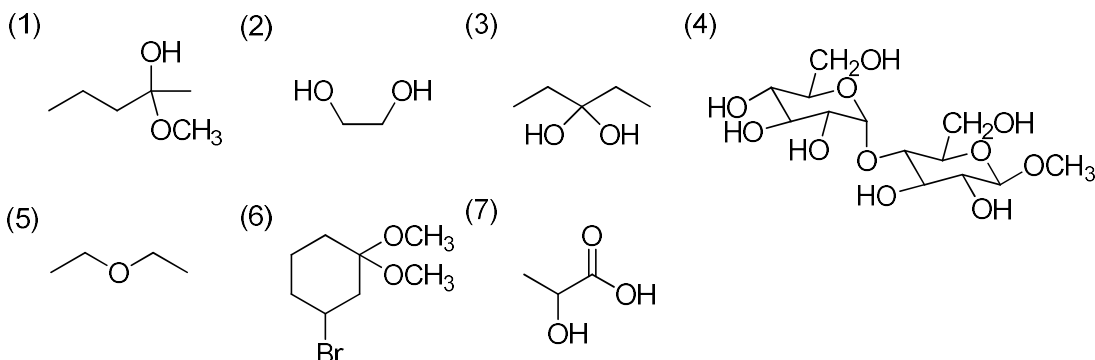


14. A student preserved compound **B** in open air at room temperature. A few days later, due to high humidity (湿度), he noticed that almost all compound **B** were decomposed, but another general aldehyde preserved nearby didn't show the same result. Please explain this strange phenomena, and predict the structure after decomposition. (10 point)



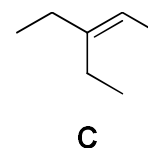
15. (a) Which of the following compound(s) are acetal? (5 point)

(b) Which of the following compound(s) are hydrate? (5 point)



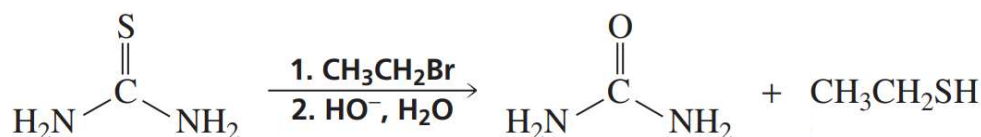
16. (a) Provide two sets of starting material to synthesize compound **C**, both of them will undergo Wittig reaction. (5 point each)

(b) Give an explain that which set of compound is better way in practice. (10 point)



17. Propose a reasonable mechanism for the following reaction. (15 point each)

(a)



(b)

