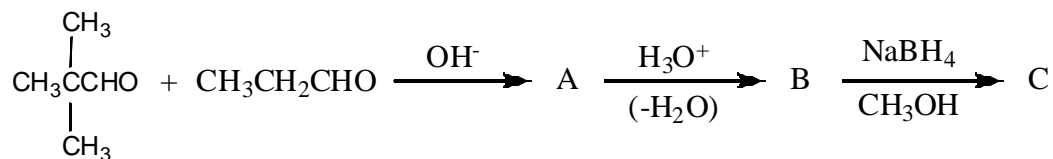
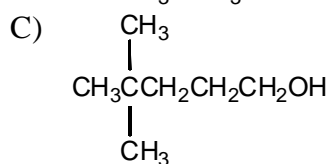
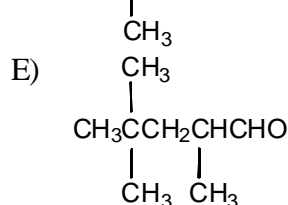
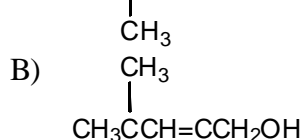
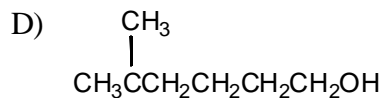
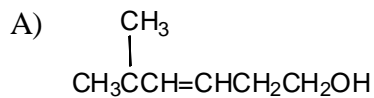


Sample Questions for Exam 3

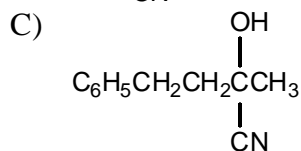
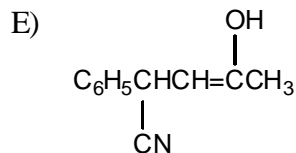
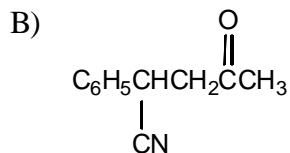
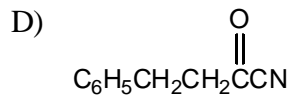
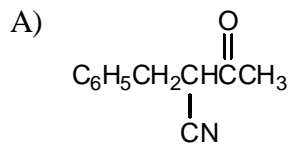
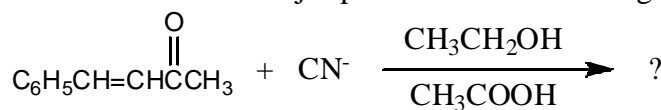
1. The product, C, of the following sequence of reactions,



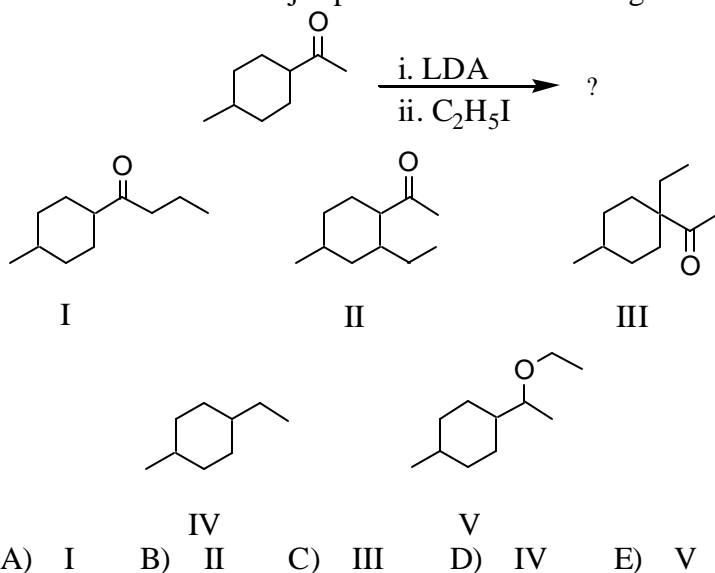
would be:



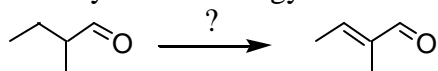
2. What would be the major product of the following reaction?



3. What would be the major product of the following reaction sequence?

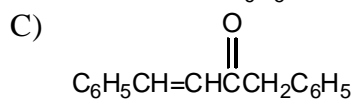
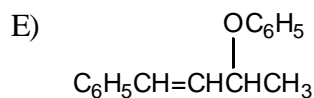
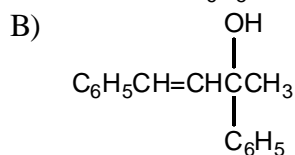
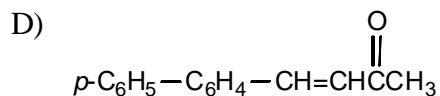
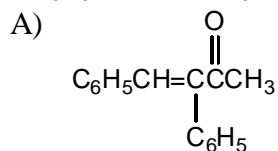
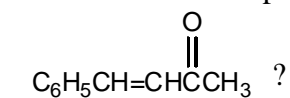


4. What synthetic strategy would accomplish the following transformation?

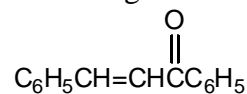


- A) i) $\text{Br}_2, \text{H}_3\text{O}^+$; ii) $\text{NaOC}_2\text{H}_5, \text{C}_2\text{H}_5\text{OH}, \text{heat}$
 B) i) $\text{Cl}_2, \text{FeCl}_3$; ii) $\text{NaOC}_2\text{H}_5, \text{C}_2\text{H}_5\text{OH}, \text{heat}$
 C) i) HCN ; ii) $\text{H}_3\text{O}^+, \text{heat}$
 D) i) $\text{Br}_2, \text{h}\nu$; ii) $(\text{CH}_3)_3\text{COK}, (\text{CH}_3)_3\text{COH}, \text{heat}$
 E) i) $\text{Br}_2, \text{H}_3\text{O}^+$; ii) $(\text{CH}_3)_3\text{COK}, (\text{CH}_3)_3\text{COH}, \text{heat}$

5. Which of these is a product of the reaction of $\text{C}_6\text{H}_5\text{MgBr}$ with



6. Which reagents would you use to synthesize this compound by an aldol condensation?



- A) $\text{C}_6\text{H}_5\overset{\text{O}}{\parallel}\text{CH}$ and $\text{C}_6\text{H}_5\text{CH}_2\overset{\text{O}}{\parallel}\text{CH}$
- B) $\text{C}_6\text{H}_5\text{CH}_2\overset{\text{O}}{\parallel}\text{CH}$ and $\text{C}_6\text{H}_5\overset{\text{O}}{\parallel}\text{CCH}_3$
- C) $\text{C}_6\text{H}_5\text{CH}=\text{CH}\overset{\text{O}}{\parallel}\text{CH}$ and $\text{C}_6\text{H}_5\text{OH}$

- D) $\text{C}_6\text{H}_5\overset{\text{O}}{\parallel}\text{CCH}_3$ and $\text{C}_6\text{H}_5\overset{\text{O}}{\parallel}\text{CH}$
- E) $(\text{C}_6\text{H}_5)_2\text{CuLi}$ and $\text{CH}_2=\text{CH}\overset{\text{O}}{\parallel}\text{C}_6\text{H}_5$

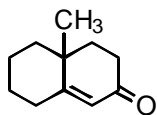
7. The aldol condensation product formed from 3-pentanone in the presence of base has the IUPAC name:

- A) 5-Ethyl-4-methyl-4-hepten-3-one
- B) 5-Ethyl-4-methyl-5-hepten-3-one
- C) 4-Methyl-4-nonen-3,7-dione
- D) 3-Ethyl-4-methyl-3-hepten-5-one
- E) 3-Ethyl-4-methyl-2-hepten-5-one

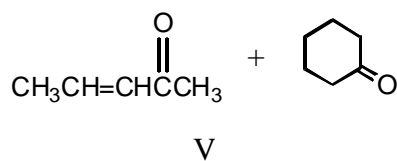
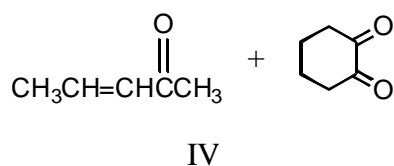
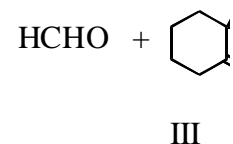
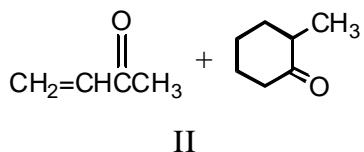
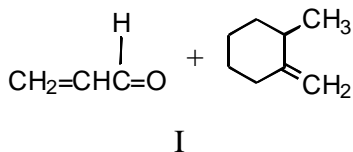
8. Which reagent would best serve as the basis for a simple chemical test to distinguish between 2-pentanone and 3-pentanone?

- A) NaOI (I_2 in NaOH)
- B) Br_2/CCl_4
- C) $\text{CrO}_3/\text{H}_2\text{SO}_4$
- D) $\text{NaHCO}_3/\text{H}_2\text{O}$
- E) $\text{Ag}(\text{NH}_3)_2^+$

9. The Robinson annulation reaction which produces



uses which of the following as starting materials?

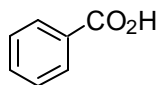


A) I B) II C) III D) IV E) V

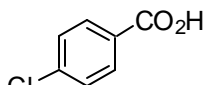
10. In which of the following sequences are the compounds listed in order of decreasing acidity?

- A) $\text{CH}_3\text{COOH} > \text{H}_2\text{O} > \text{CH}_3\text{CH}_2\text{OH} > \text{HC}\equiv\text{CH} > \text{NH}_3$
 B) $\text{CH}_3\text{CH}_2\text{OH} > \text{CH}_3\text{COOH} > \text{H}_2\text{O} > \text{HC}\equiv\text{CH} > \text{NH}_3$
 C) $\text{CH}_3\text{COOH} > \text{CH}_3\text{CH}_2\text{OH} > \text{H}_2\text{O} > \text{NH}_3 > \text{HC}\equiv\text{CH}$
 D) $\text{H}_2\text{O} > \text{CH}_3\text{COOH} > \text{CH}_3\text{CH}_2\text{OH} > \text{HC}\equiv\text{CH} > \text{NH}_3$
 E) $\text{CH}_3\text{CH}_2\text{OH} > \text{H}_2\text{O} > \text{CH}_3\text{COOH} > \text{HC}\equiv\text{CH} > \text{NH}_3$

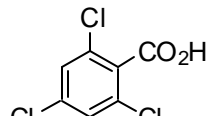
11. Which of the following would be the strongest acid?



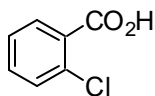
I



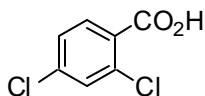
II



III



IV



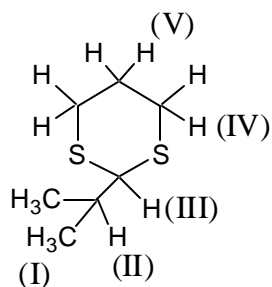
V

A) I B) II C) III D) IV E) V

16. Which of the following is not a method for preparing butanoic acid?

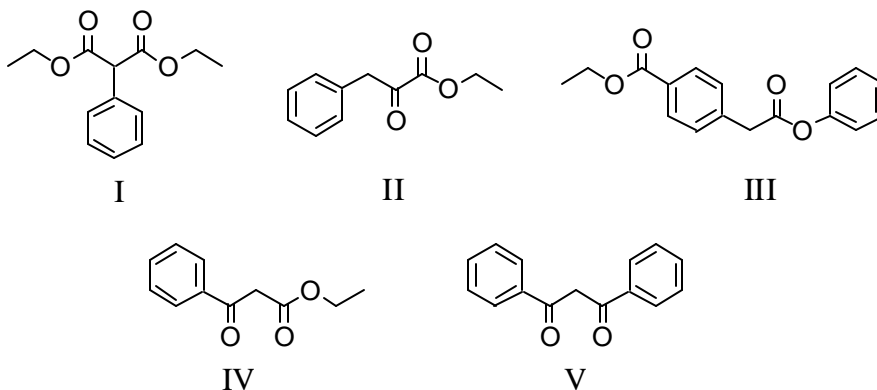
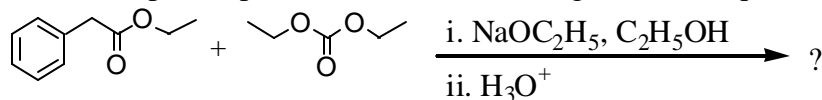
- A) $\text{CH}_3\text{CH}_2\text{CH}_2\text{Br} + \text{NaCN}$; then H_3O^+ , reflux
 B) $\text{CH}_3\text{CH}_2\text{CH}_2\text{MgBr} + \text{CO}_2$; then H_3O^+
 C) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH} + \text{CO}$
 D) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CO}_2\text{Et} + \text{OH}^-/\text{H}_2\text{O}$; then H_3O^+
 E) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH} + \text{KMnO}_4/\text{OH}^-/\text{H}_2\text{O}/\text{heat}$; then H_3O^+

17. Which of the indicated hydrogens can be replaced by alkylation?



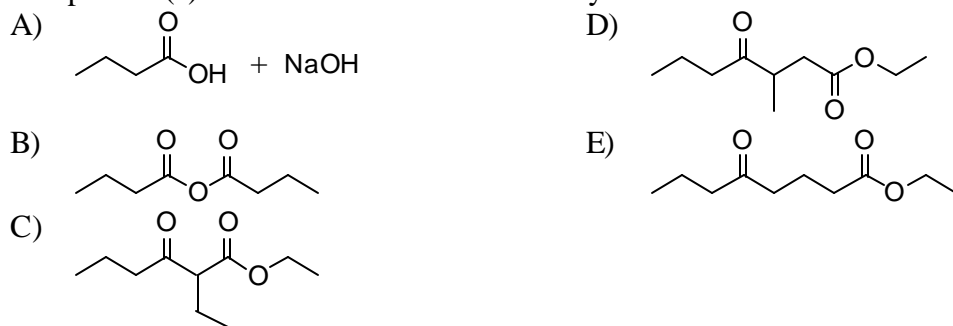
- A) I B) II C) III D) IV E) V

18. What is the expected product from the following reaction sequence?

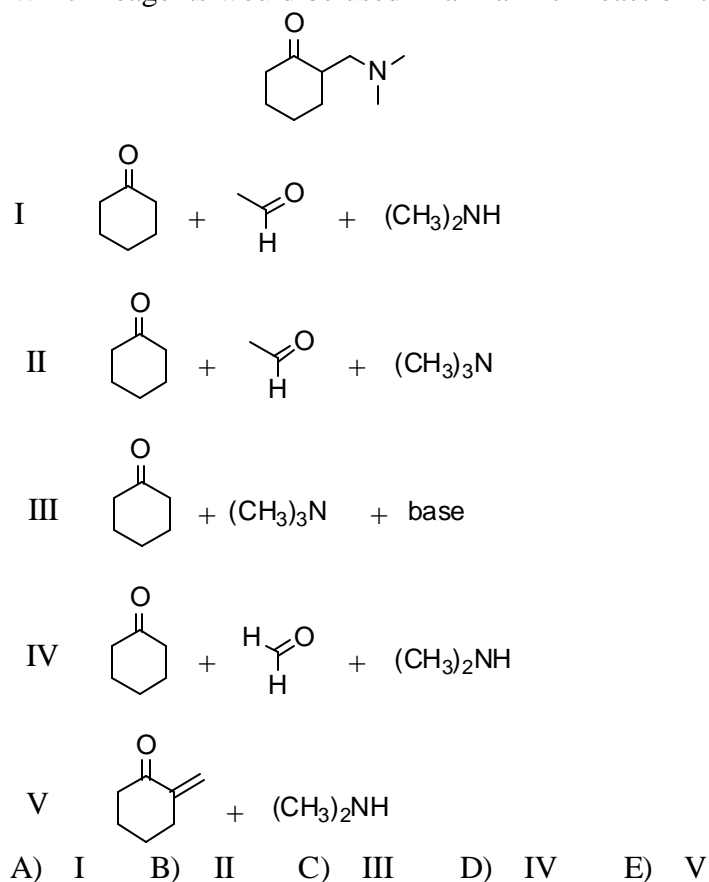


- A) I B) II C) III D) IV E) V

19. The product(s) of the reaction of 2 mol of ethyl butanoate with sodium ethoxide is (are):



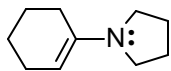
20. Which reagents would be used in a Mannich reaction to synthesize



21. Which organic reagents would you need to make 2-ethylheptanoic acid from diethyl malonate?

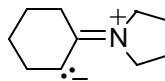
- A) Bromoethane, 1-bromopentane, sodium ethoxide, and potassium tert-butoxide
 B) 3-Bromooctane and sodium ethoxide
 C) 3-Bromoheptane and sodium ethoxide
 D) 1-Bromopropane, 2-bromopentane, sodium ethoxide, and potassium tert-butoxide
 E) 2-Bromoheptane and potassium tert-butoxide

22. Which of the following statements is true of the enamine,



A) The enamine can be made from cyclohexanone + pyrrolidine.

B)



It has another resonance structure :

C) It can be acylated at the α -carbon of the original carbonyl compound.

D) It can be alkylated.

E) All of the above are true.

23. Which of these is not a reversible process?

A) Base-promoted ester hydrolysis

D) Claisen condensation

B) Acid-catalyzed ester hydrolysis

E) Acetal formation

C) Aldol addition

24. What final product is expected when toluene is subjected to the following reaction sequence?

i) KMnO_4 , NaOH ; ii) H_3O^+ (product = $\text{C}_7\text{H}_6\text{O}_2$); iii) SOCl_2 ;

iv) NH_3 (product = $\text{C}_7\text{H}_7\text{NO}$); v) Br_2 , NaOH

A) $\text{C}_6\text{H}_5\text{CONH}_2$

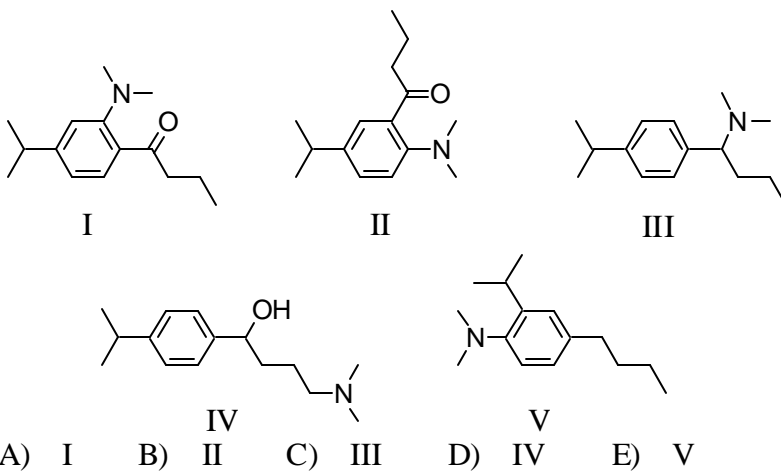
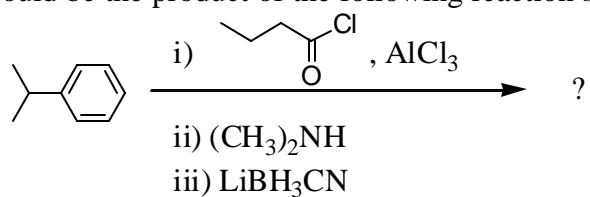
D) *p*- $\text{CH}_3\text{C}_6\text{H}_4\text{NH}_2$

B) $\text{C}_6\text{H}_5\text{CH}_2\text{NH}_2$

E) $\text{C}_6\text{H}_5\text{NH}_2$

C) *p*- $\text{CH}_3\text{C}_6\text{H}_4\text{SO}_2\text{NH}_2$

25. What would be the product of the following reaction sequence?



Answer Key

1. B
2. B
3. A
4. A
5. B
6. D
7. A
8. A
9. B
10. A
11. C
12. C
13. A
14. D
15. C
16. C
17. C
18. A
19. C
20. D
21. A
22. E
23. A
24. E
25. C