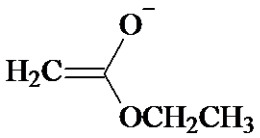
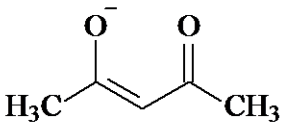
# ACS Review Ester Enolates

1. Rank the compounds below in order of decreasing basicity.




I


II




III

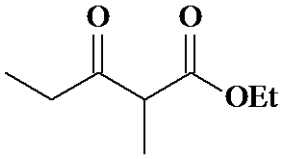
   A. II > III > I
   B. II > I > III
   C. III > I > II
   D. I > III > II

2. Which of the following works best as a base to quantitatively convert ethyl acetate, $CH_3CO_2CH_2CH_3$, to its enolate?

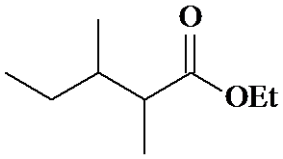
   A. NaOH
   B. $KOC(CH_3)_3$
   C. $CH_3Li$
   D. $[(CH_3)_2CH]_2NLi$

3. Which of the following is the Claisen condensation product of ethyl propanoate, $CH_3CH_2CO_2Et$?

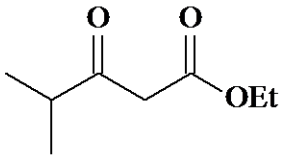
A)



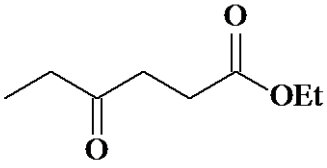

B)




C)




D)




   A. A
   B. B
   C. C
   D. D

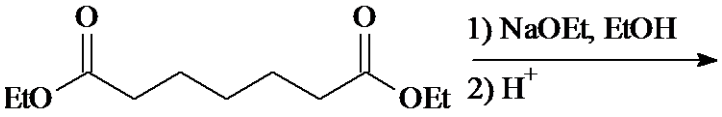
4. Which one of the following would <u>not</u> give an appreciable yield of Claisen condensation product?

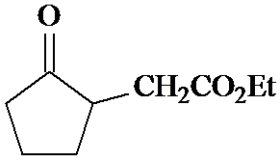
A. ethyl hexanoate
B. ethyl 2-methylhexanoate
C. ethyl 3-methylhexanoate
D. ethyl 4-methylhexanoate

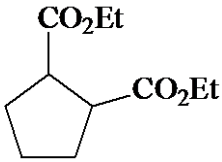
5. How many different Claisen condensation products are possible in the reaction of equal amounts of ethyl acetate ($CH_3CO_2Et$) and ethyl propanoate ($CH_3CH_2CO_2Et$)?

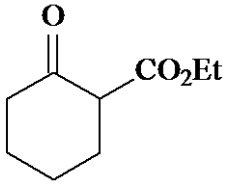
A. only one
B. two
C. three
D. four

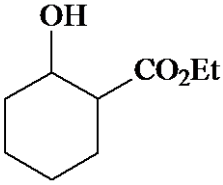
6. What is the product of the reaction shown below?




A)


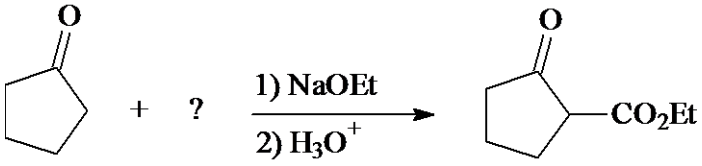

B)



C)



D)


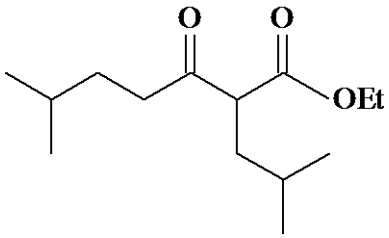

A. A
B. B
C. C
D. D

7. Identify the missing reagent in the reaction shown below.



A. ethyl formate, $HCO_2Et$
B. diethyl carbonate, $(EtO)_2C=O$
C. diethyl oxalate, $EtO_2CCO_2Et$
D. ethyl acetate, $CH_3CO_2Et$

8. Which one of the following esters gives the Claisen condensation product shown below?




A. ethyl 2-methylpentanoate
B. ethyl 4-methylpentanoate
C. ethyl 3,3-dimethylbutanoate
D. ethyl 5-methylhexanoate

9. Which one of the following cannot give a Claisen condensation product?

A. $(CH_3)_3CCO_2Et$
B. $C_6H_5CH_2CO_2Et$
C. $H_2C=CHCH_2CH_2CO_2Et$
D. $(CH_3)_2CHCH_2CO_2Et$

10. What is the product of the following reaction?

$$C_6H_5CO_2Et + CH_3CH_2CO_2Et \xrightarrow[(2)\ H_3O^+]{(1)\ NaOCH_2CH_3}$$

A) $C_6H_5C(=O)CH_2CH_2C(=O)OEt$

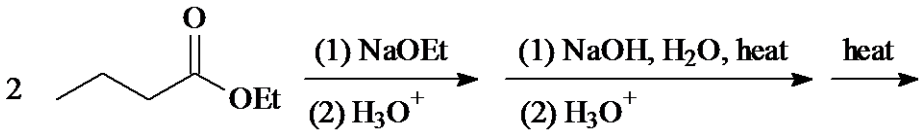
B) $C_6H_5C(=O)CH(CH_3)C(=O)OEt$

C) $CH_3CH_2C(=O)OCC_6H_5$

D) $CH_3CH(CH_3)C(=O)OCC_6H_5$

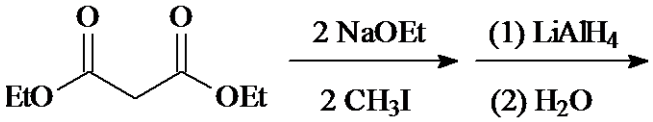
A. A
B. B
C. C
D. D

11. Which of the following is the product of the reaction sequence shown below?



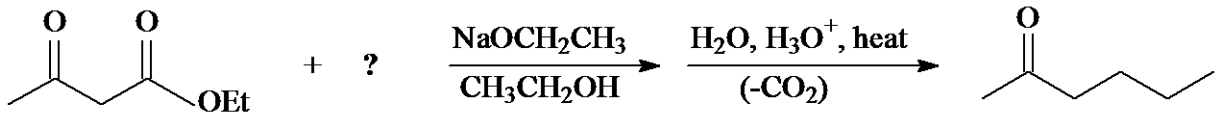

A. 4-methyl-3-hexanone
B. 4-heptanone
C. 2-propylbutanoic acid
D. 2-ethylpentanoic acid

12. What is the product of the following reactions?



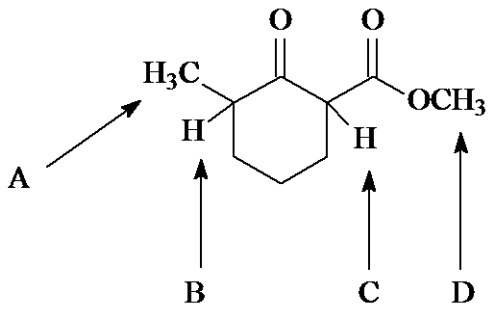

A. 2,2-dimethylpropanedioic acid
B. 2-methylpropanoic acid
C. 2-methyl-1-propanol
D. 2,2-dimethyl-1,3-propanediol

13. Which of the following could be used as the missing reagent to carry out the following transformation?



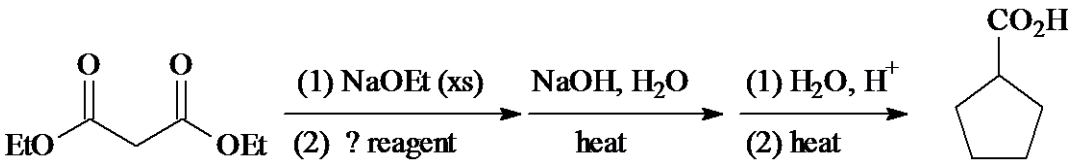

A. $CH_3CH{=}O$
B. $CH_3CH_2CH_2OH$
C. $CH_3CH_2CH_2Br$
D. $CH_3CH_2CH_2CH_2I$

14. Identify the most acidic hydrogen on the following molecule.



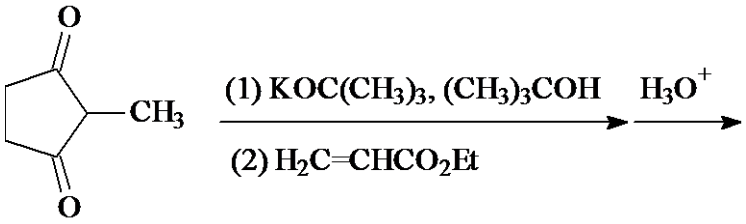

A. A
B. B
C. C
D. D

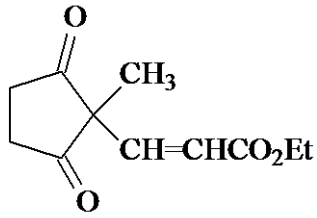
15. What is the missing reagent in the synthesis shown below?




A. bromocyclopentane
B. 1,4-dibromobutane
C. 1,5-dibromopentane
D. 1,1-dibromocyclopentane

16. Which of the following is the Michael addition product of the reaction below?




A)
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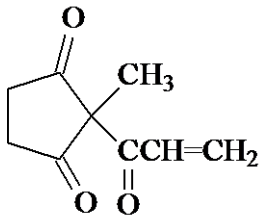
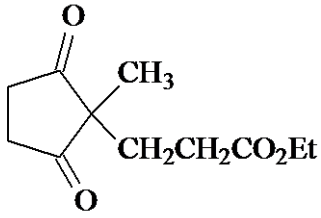
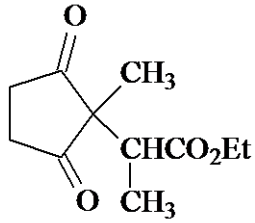
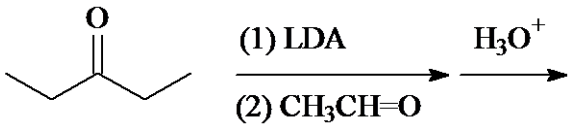


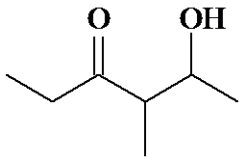

C)


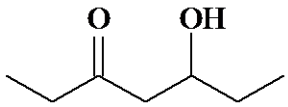

D)


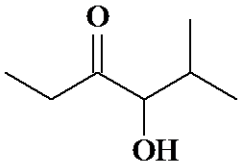

A. A
B. B
C. C
D. D

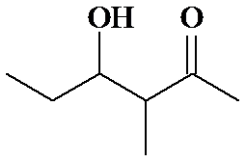
17. Which of the following is the product in the reaction shown below?




A) 

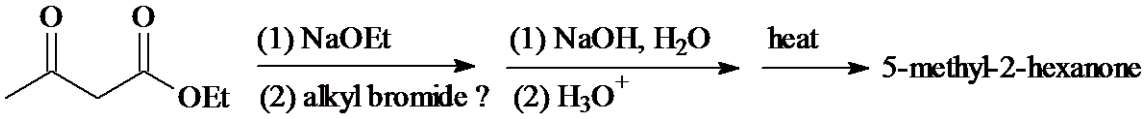
B) 

C) 

D) 

A. A
B. B
C. C
D. D

18. The acetoacetic ester synthesis, shown below, can be used to prepare 5-methyl-2-hexanone. Which one of the following alkyl bromides would be used in the synthesis?

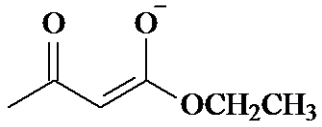


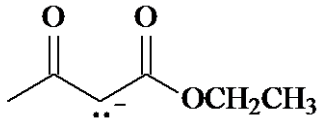

A. $(CH_3)_2CHBr$
B. $(CH_3)_2CHCH_2Br$
C. $(CH_3)_2CHCH_2CH_2Br$
D. $CH_3CH_2CHBrCH_3$

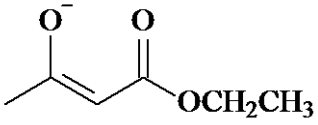
19. Heating butylmalonic acid, $CH_3CH_2CH_2CH_2CH(CO_2H)_2$, to 140°C yields:

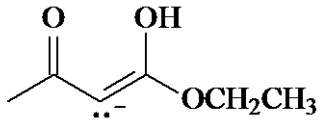
A. hexanoic acid
B. pentanoic acid
C. 2-methylpentanoic acid
D. 2-hexenoic acid

20. Which one of the following is not a resonance form of the enolate ion formed from ethyl acetoacetate?

A) 

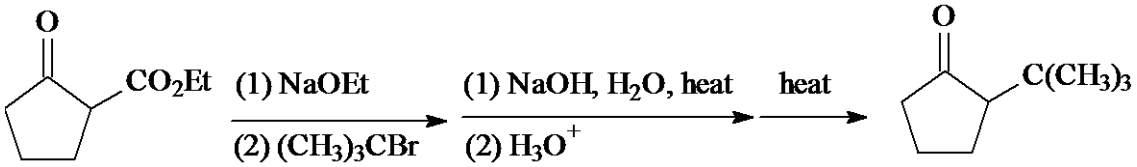
B) 

C) 

D) 

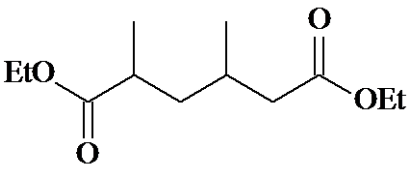
A. A
B. B
C. C
D. D

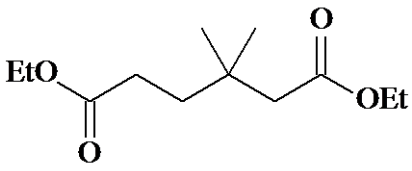
21. Consider the following synthetic scheme below. Which one of the following best explains why the synthesis does not work?

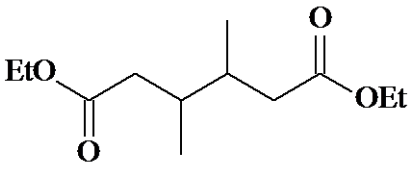


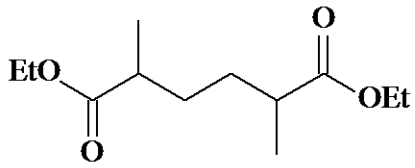
A. Using NaOEt gives Claisen condensation instead of alkylation.
B. The alkyl halide used will lead to elimination rather than alkylation.
C. The keto-acid formed does not decarboxylate in the last step.
D. The base-promoted hydrolysis step does not work on the β-keto ester intermediate.

22. Which one of the following would not be expected to give a significant yield in a Dieckmann condensation?

A) 

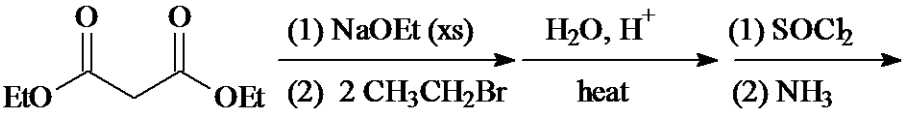
B) 

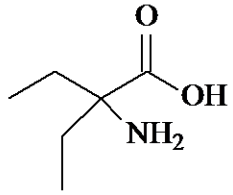
C) 

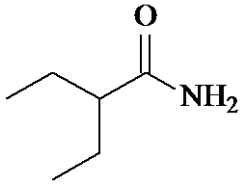

D) 

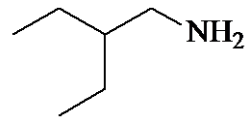

A. A
B. B
C. C
D. D

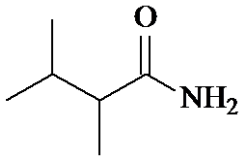
23. What is the product of the following reaction sequence?




A) 

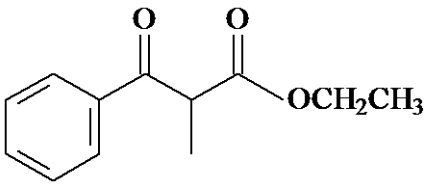

B) 


C) 


D) 


A. A
B. B
C. C
D. D

24. The following compound can be synthesized by a mixed Claisen condensation. Identify the two compounds which give this condensation product.



A) $C_6H_5\overset{\overset{O}{\|}}{C}CH_2CH_3$ and $HCO_2CH_2CH_3$

B) $C_6H_5CO_2CH_2CH_3$ and $CH_3CH_2CO_2CH_2CH_3$

C) $C_6H_5CO_2CH_2CH_3$ and $CH_3CO_2CH_2CH_3$

D) $C_6H_5\overset{\overset{O}{\|}}{C}H$ and $CH_3CH_2CO_2CH_2CH_3$

A. A
B. B
C. C
D. D

# ACS Review Ester Enolates KEY

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