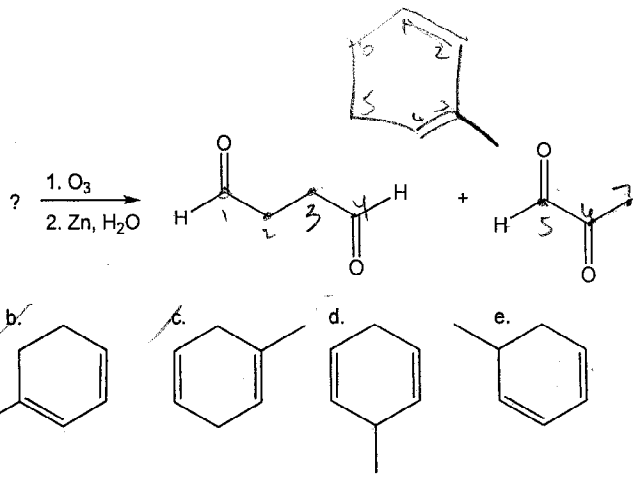
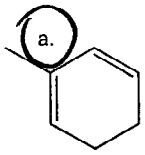
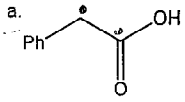
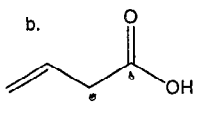
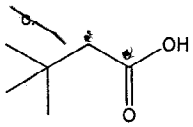
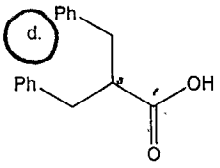
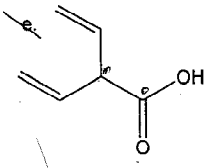
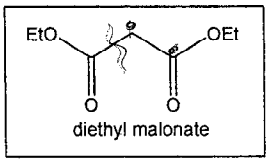
1. A cyclic diene formed the following ozonolysis products. What is the structure of the diene?



a. 
b.
c.
d.
e.

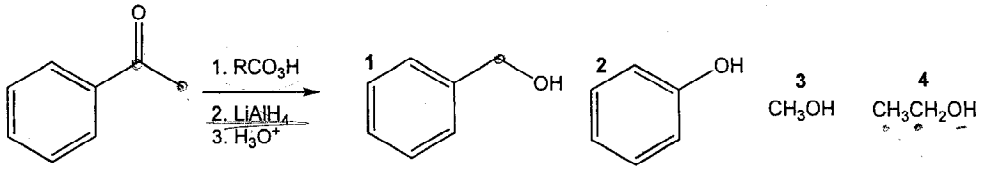
2. Which of the following can be prepared by a malonic ester synthesis. (ie, starting from diethyl malonate)

a. 
b. 

d. 
e. 

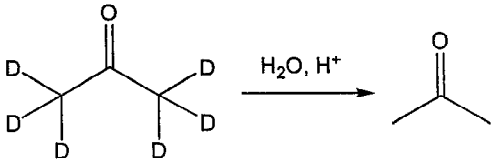


3. Indicate the major products formed.

a. 1, 4
b. 1, 3
c. 2, 3
d. 2, 4
e. 1, 2

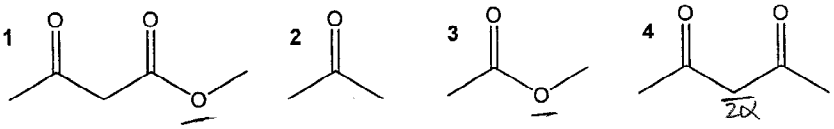


4. Adding a few drops of hexadeuterated acetone to a test tube of aqueous acid causes loss of the deuterium label (see figure at right). This conversion is mediated by the formation of:



a. hydrate b. enol c. enolate
d. more than one of the above

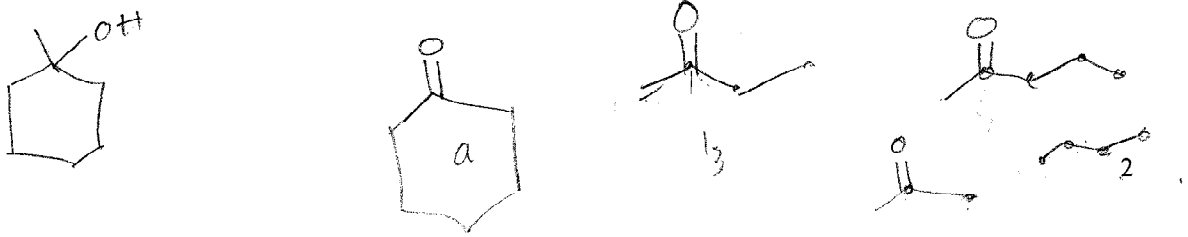
5. Rank the following in order of decreasing acidity (in other words, from most acidic to least).



a. 2 > 3 > 1 > 4 b. 3 > 4 > 2 > 1 c. 4 > 1 > 2 > 3 d. 1 > 4 > 3 > 2
e. none of the above answer choices, a-d, are correct

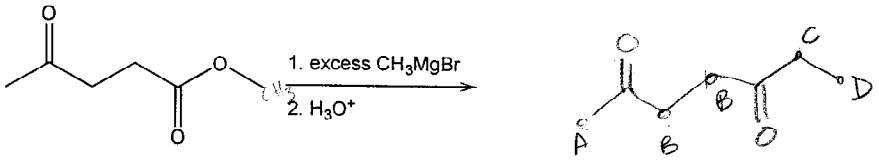
6. 3-methyl-3-hexanol can be made three different ways by reacting a Grignard reagent with an appropriate ketone (following by acidification). Which of the following Grignards would not be useful in this prep?

a. MeMgBr b.EtMgBr c. PrMgBr d. BuMgBr

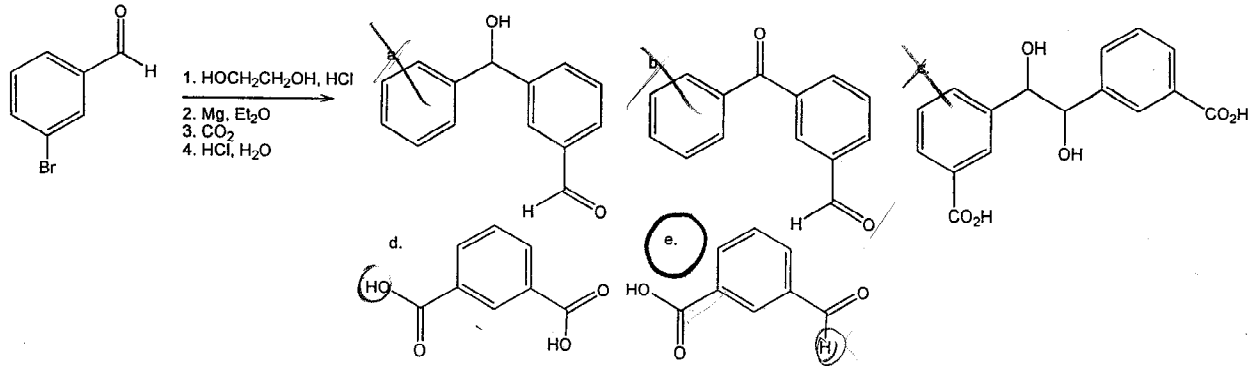


7. How many signals would the product (singular) of the following reaction show in its ^{1}H NMR spectrum?

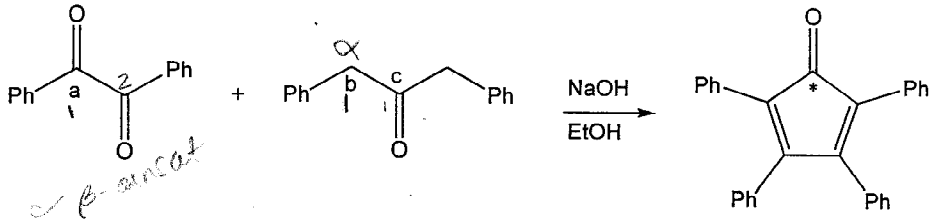
a. 3 b. 4 c. 5 d. 6 e. 7 or more



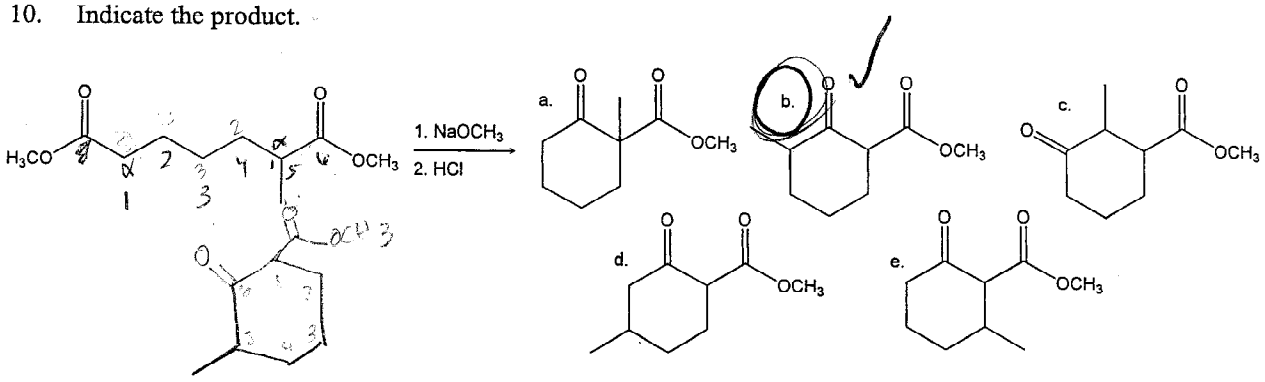
8. Indicate the product



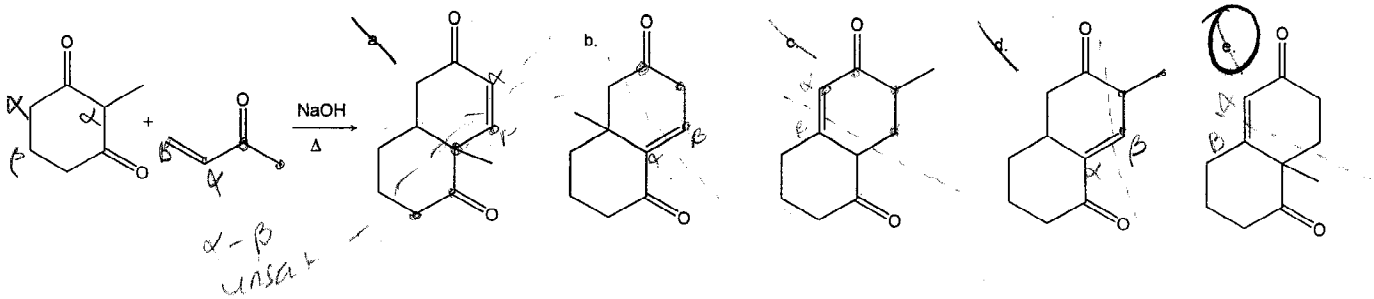
9. The asterisked carbon in the product corresponds to which labeled carbon in the starting materials?



10. Indicate the product.



11. Indicate the product of the following Robinson annulation.



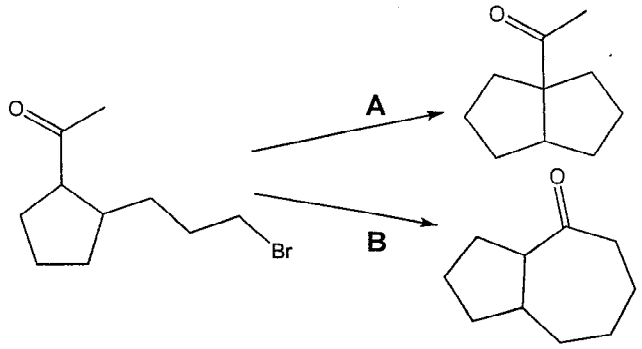
12. Indicate the preferred reagents/conditions for synthetic pathways **A** and **B**, respectively.

a. LDA, THF, -78°C; KH or NaOH, 25°C

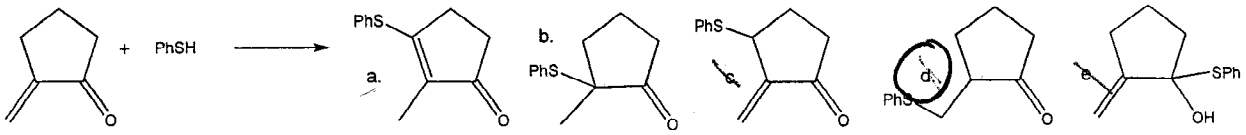
b. KH or NaOH, 25°C; LDA, THF, -78°C

c. LDA, THF, 25°C; KH or NaOH, -78°C

d. KH or NaOH, -78°C; LDA, THF, 25°C

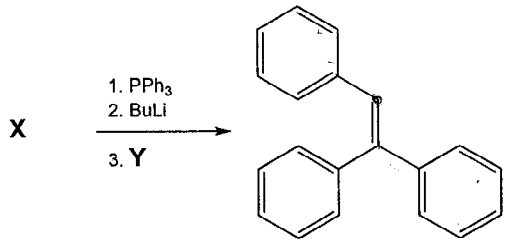


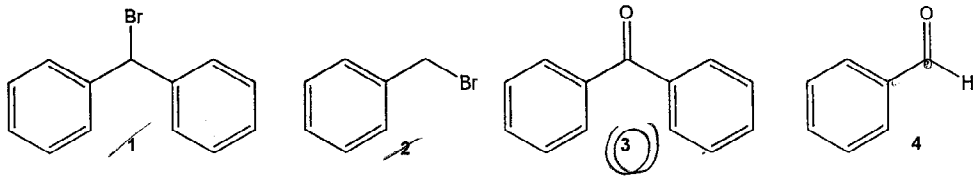
13. Indicate the major product:



14. Which is the preferred starting material, **X**, and compound **Y**, respectively, in the following scheme?

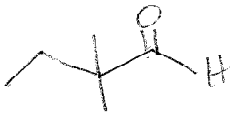
a. 1, 4
b. 1, 3
c. 2, 3
d. 2, 4
e. there is no preferred X and Y



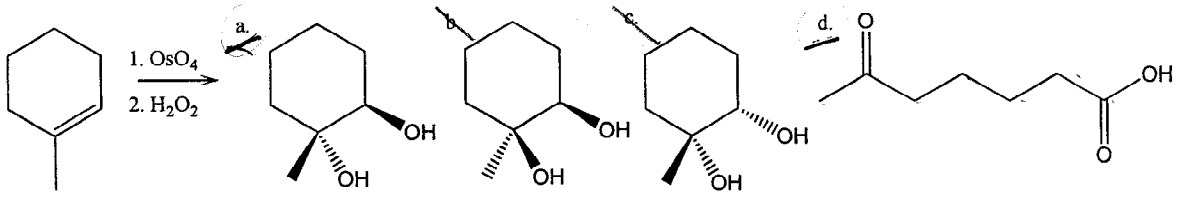


15. Treating 2,2-dimethylbutanal with sodium borohydride followed by weak acid results in a:

a. 1° alcohol b. 2° alcohol c. 3° alcohol d. carboxylic acid e. none of the above

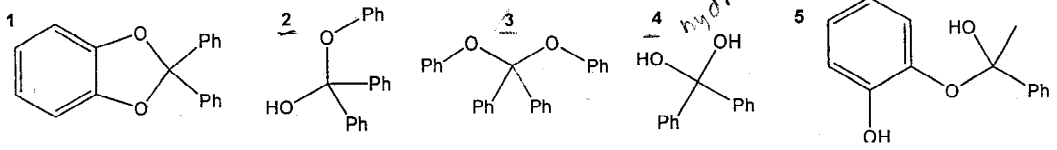


16. Indicate the product(s).



c. more than one of the above

Use the following structures to answer the next four questions

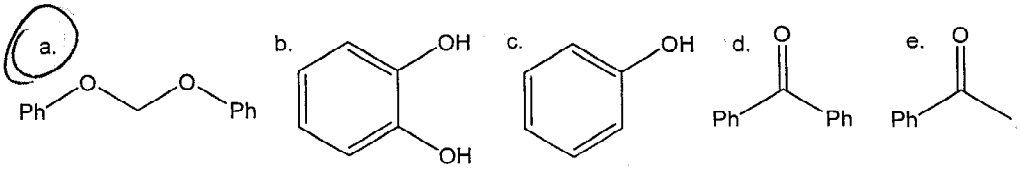


17. Identify the ketal(s) and/or acetal(s):
a. 1, 2 b. 1, 3 c. 3 only d. 2, 5 e. 4 only

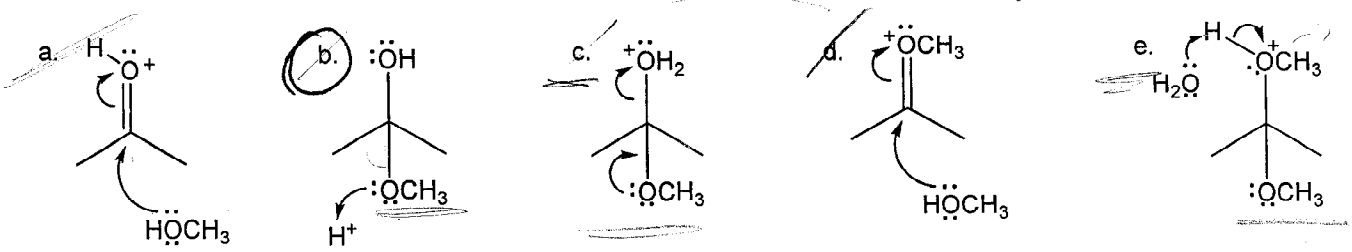
18. Identify hemiacetal(s) and/or hemiketal(s):
a. 2 only b. 2, 4 c. 2, 4, 5 d. 4, 5 e. 2, 5

19. Identify the hydrate(s):
a. 2 only b. 2, 4 c. 4, 5 d. 4 only e. 2, 4, 5

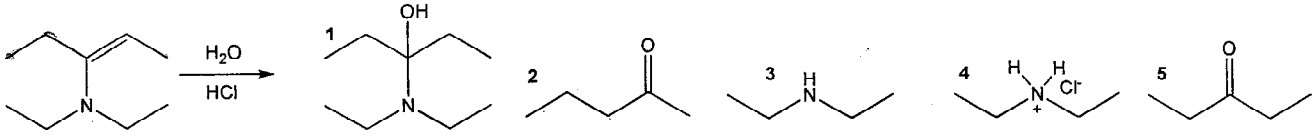
20. Which is not a starting material in the preparation of one or more the compounds shown above?



21. In the acid-catalyzed ketalization of acetone (propanone) with methanol, which of the following depicts a mechanistic step of the reaction in the reverse direction?



22. Indicate the product(s).

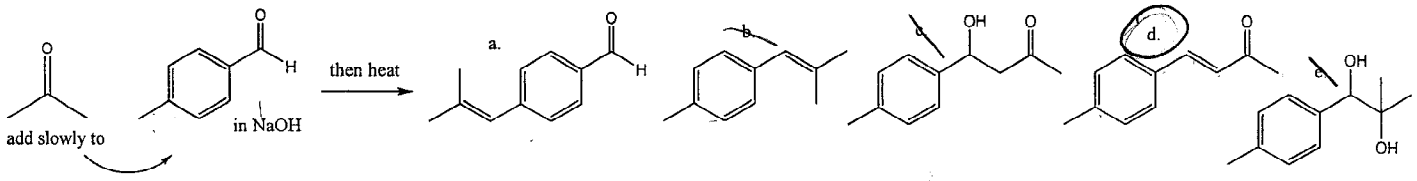


a. 1 only b. 2, 3 c. 2, 4 d. 4, 5 e. 3, 5

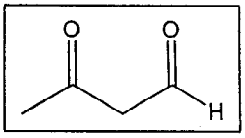
23. Which reagent(s) would you use to convert $CH_3(CH_2)_6CO_2H$ to $CH_3(CH_2)_6CH_2OH$?

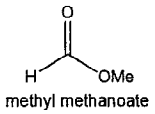
a. $NaBH_4$, then H_2O b. $LiAlH_4$, then H_3O^+ c. PCC/CH_2Cl_2
d. Zn, H_2O e. H_2CrO_4

24. Indicate the product.



25. How many of the following syntheses produce the compound at right in the box? If only one, choose "a"; if two, choose "b", and so on…

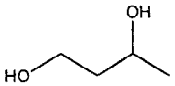




methyl methanoate

- Add acetone (propanone) slowly to excess methyl methanoate (see structure at left) in sodium methoxide/methanol, then treat with HCl

- Starting with acetone (propanone), first treat with LDA (lithium diisopropylamide), then formaldehyde (methanal), then water. Remove any trace water, then treat with PCC (pyridinium chlorochromate) in CH_2Cl_2.



1,3-butanediol

- Starting with 1,3-butanediol (see structure at left), first treat with excess DMSO and $(COCl)_2$, then treat with excess triethylamine

- Starting with ethanal, treat with a mixture of NaOH and H_2O

- Starting with 1-methylcyclopropene, treat with ozone followed by $(CH_3)_2S$

D

26. When compared to the keto form, the enol form of which of the following compounds is most stable?

a. I
b. II
c. III
d. IV
e. V