Name:_____Key_____

CHEMISTRY 3331, Fall 1999
Professor Walba
Third Hour Exam
November 18, 1999

scores:

1) 25

2) 25

3) 25

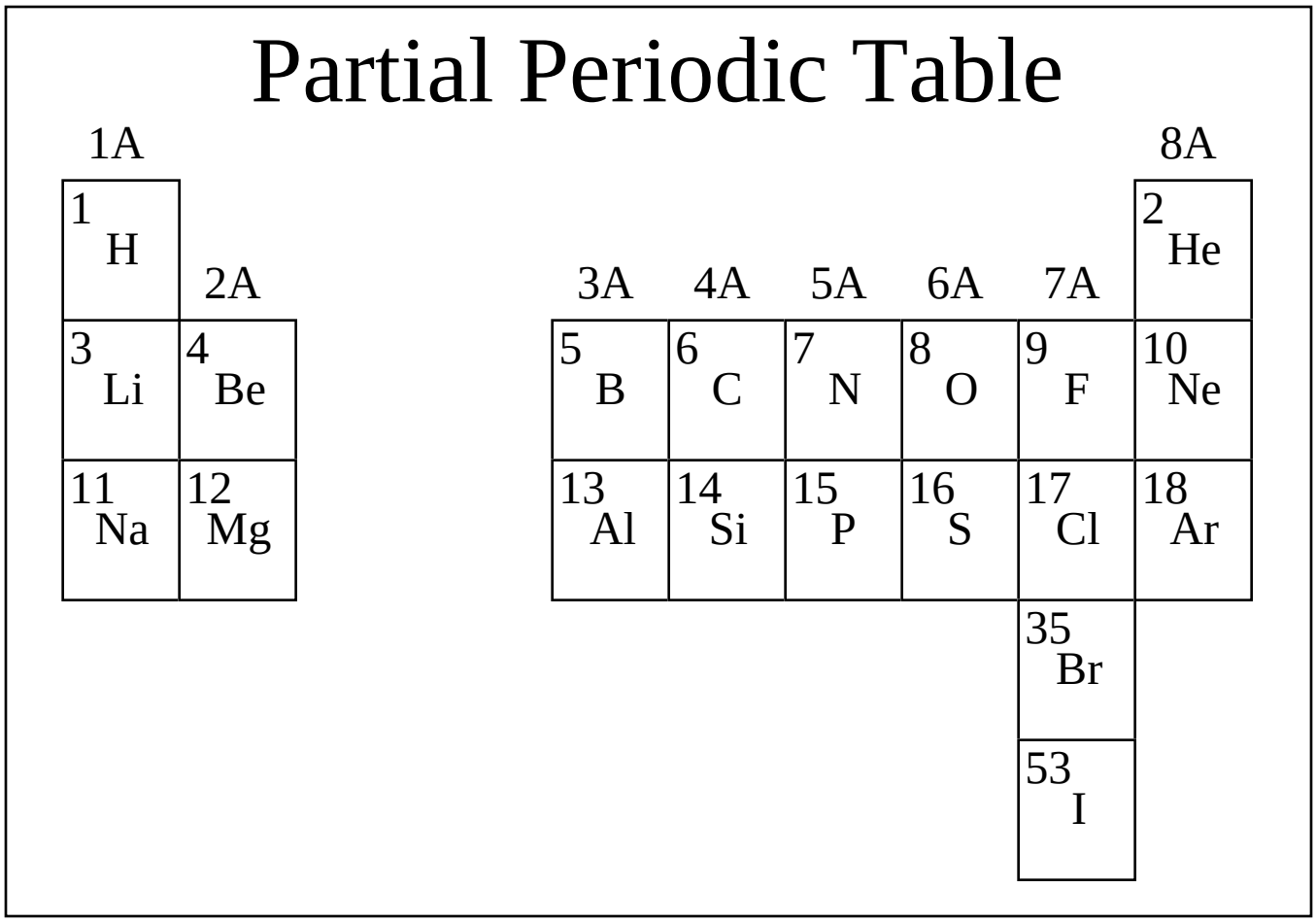
4) 25

100

This is a closed-book "open model" exam. You may use models, but no notes or books. Please put all your answers on the test. Use the backs of the pages for scratch.

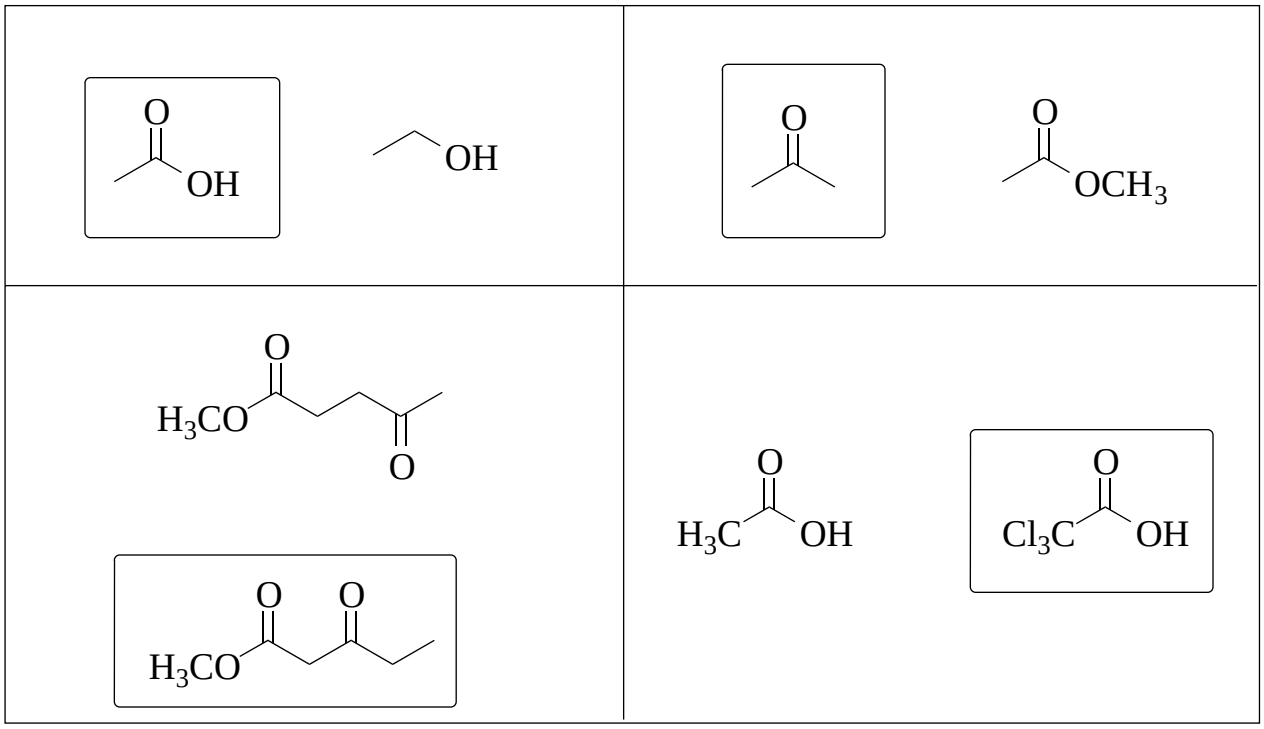
PLEASE read the questions carefully!

Partial Periodic Table

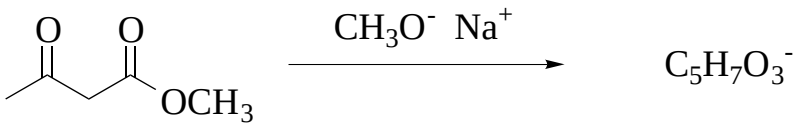


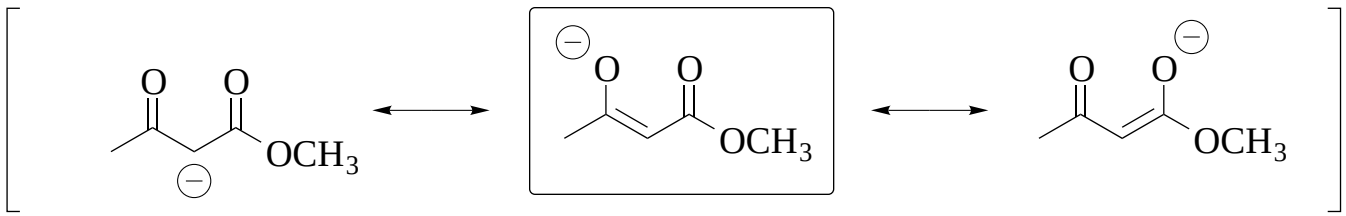
Name:_____Key_____

1) (20 pts) a) For each of the following pairs of compounds, circle the stronger Brønsted acid.



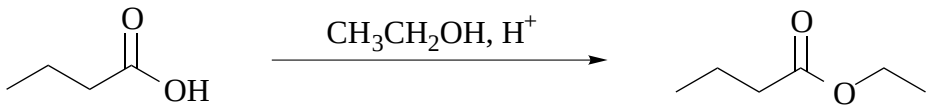
b) Treatment of methylacetoacetate with one molar equivalent of methoxide gives an anion (i.e. a negative ion) with formula $C_5H_7O_3^-$, as shown below. Give the three most important resonance contributors to the structure of this anion, and circle the major contributor.

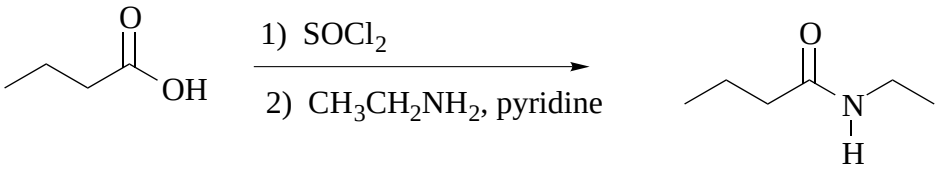


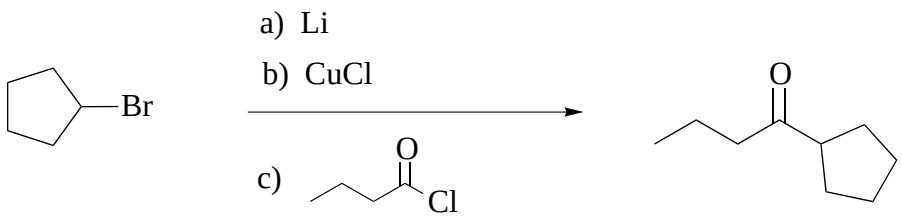


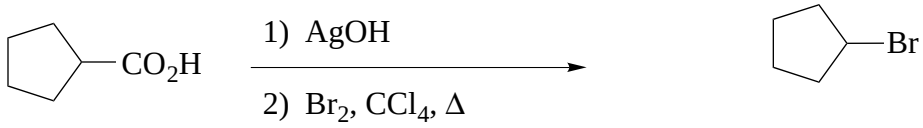
Name:_____Key_____

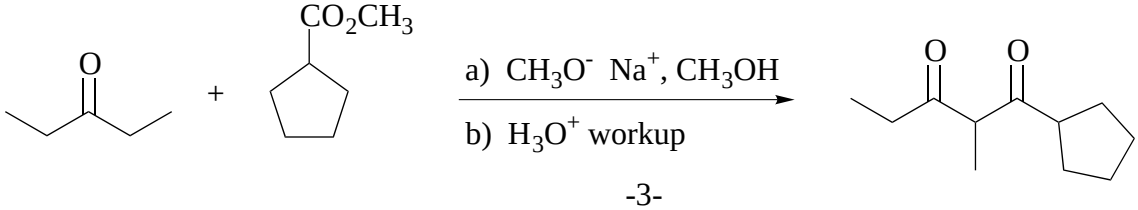
2) (25 pts) Give the single major organic product for each of the following reactions. If a racemate is formed, consider this to be one product and show only one of the enantiomers.

a) 

b) 

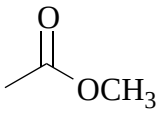
c) 

d) 

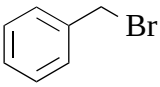
e) 

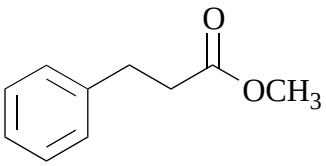
Name:_____Key_____

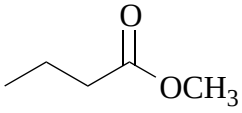
3) (25 pts) Propose reagents for accomplishing the following transformations. NOTE: more than one step may be required! Try to make your synthesis efficient (i.e. the desired product should be the major product).

a) 

a) $LiN(iPr)_2$

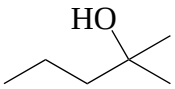
b) 

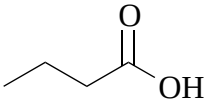


b) 

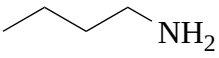
a) $H_3C^-\ MgBr^+$

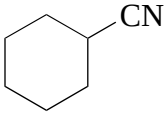
b) H_3O^+ workup



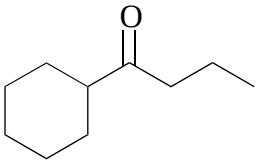
c) 

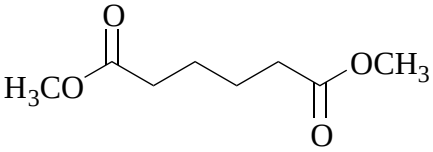
1) $SOCl_2$
2) NH_3, pyr
3) a) $LiAlH_4$
b) H_3O^+ workup

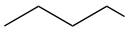


d) 

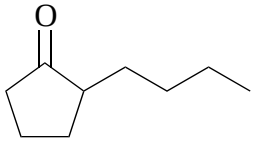
a) $CH_3CH_2CH_2^-\ MgBr^+$
b) H_3O^+



e) 

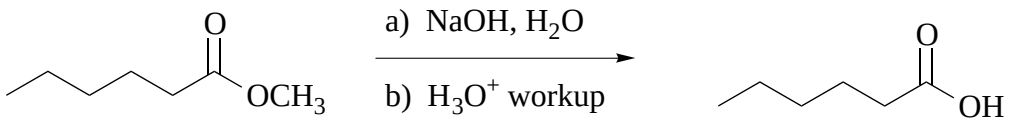
1) a) $CH_3O^-\ Na^+$, CH_3OH
b) H_3O^+ workup
2) a) $CH_3O^-\ Na^+$, CH_3OH
b) 

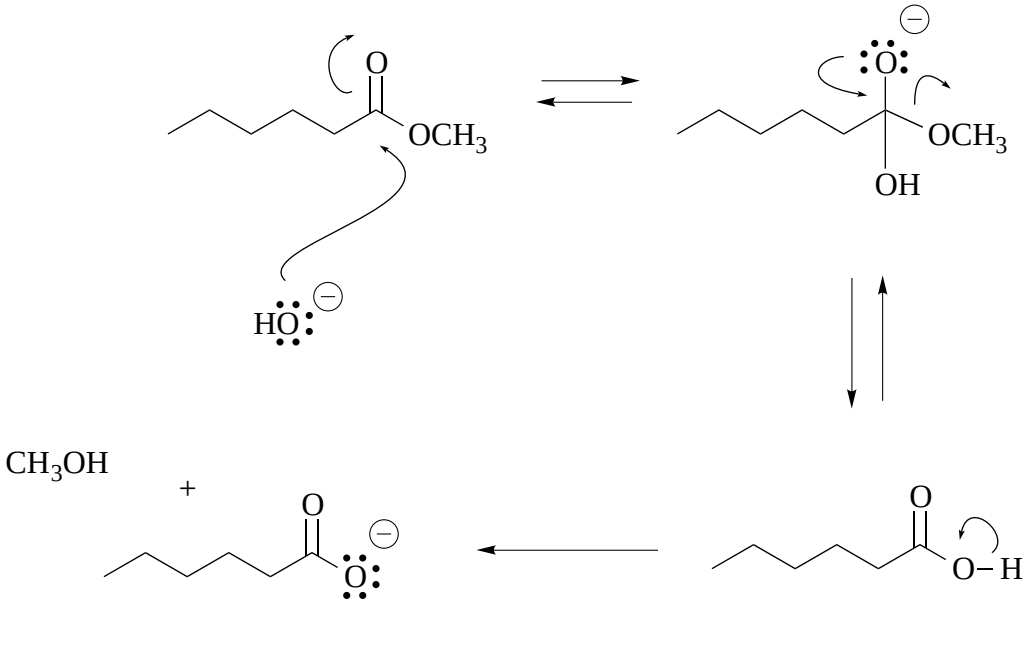
3) a) NaOH, H_2O, Δ
b) H_3O^+, Δ

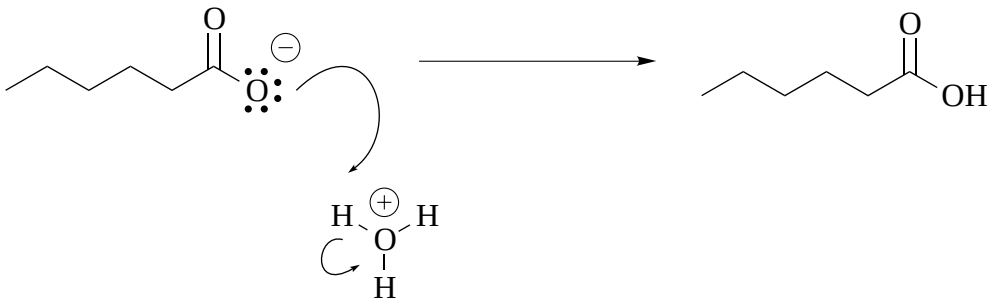


Name:_____Key_____

4) (30 pts) a) Propose an arrow-pushing mechanism for the following transformation. Don't abbreviate! Show each intermediate in the mechanism, but do not show transition states.



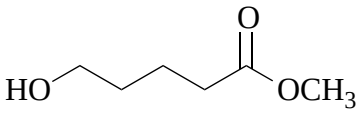




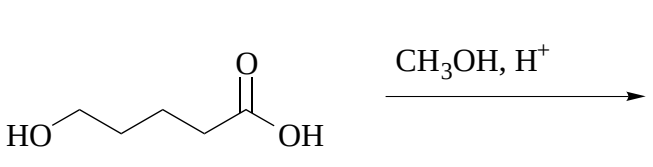
Name:_____Key_____

4 –continued-

b) In an effort to synthesize hydroxyester **1**, a student treated the hydroxyacid **2** with methanol and H^+. The product, however, was not the ester **1**, but a new compound **3**, with the molecular formula indicated below.



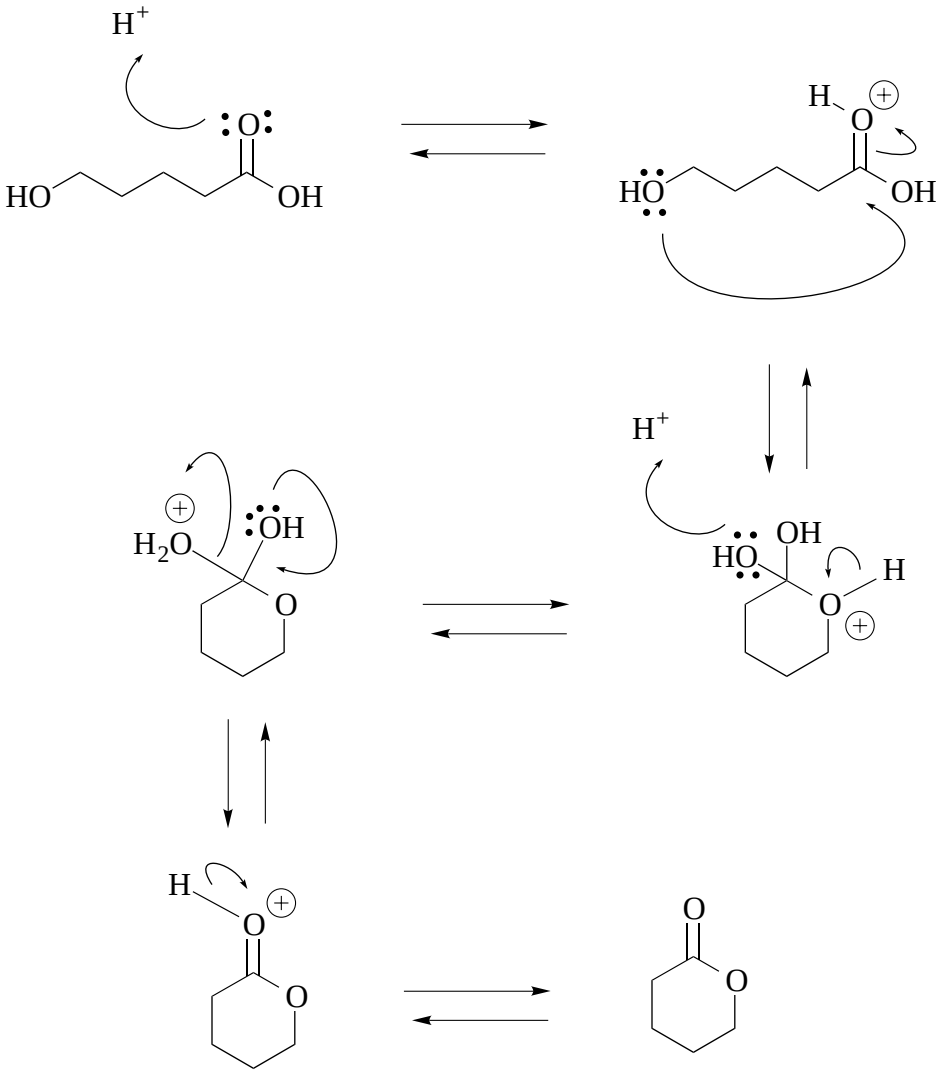
1



2

3: $C_5H_8O_2$

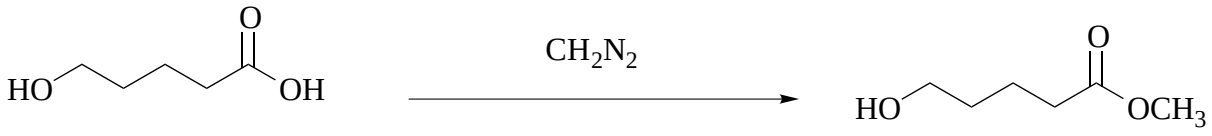
Give the structure of **3**, and propose a mechanism for its formation.



Name:_____Key_____

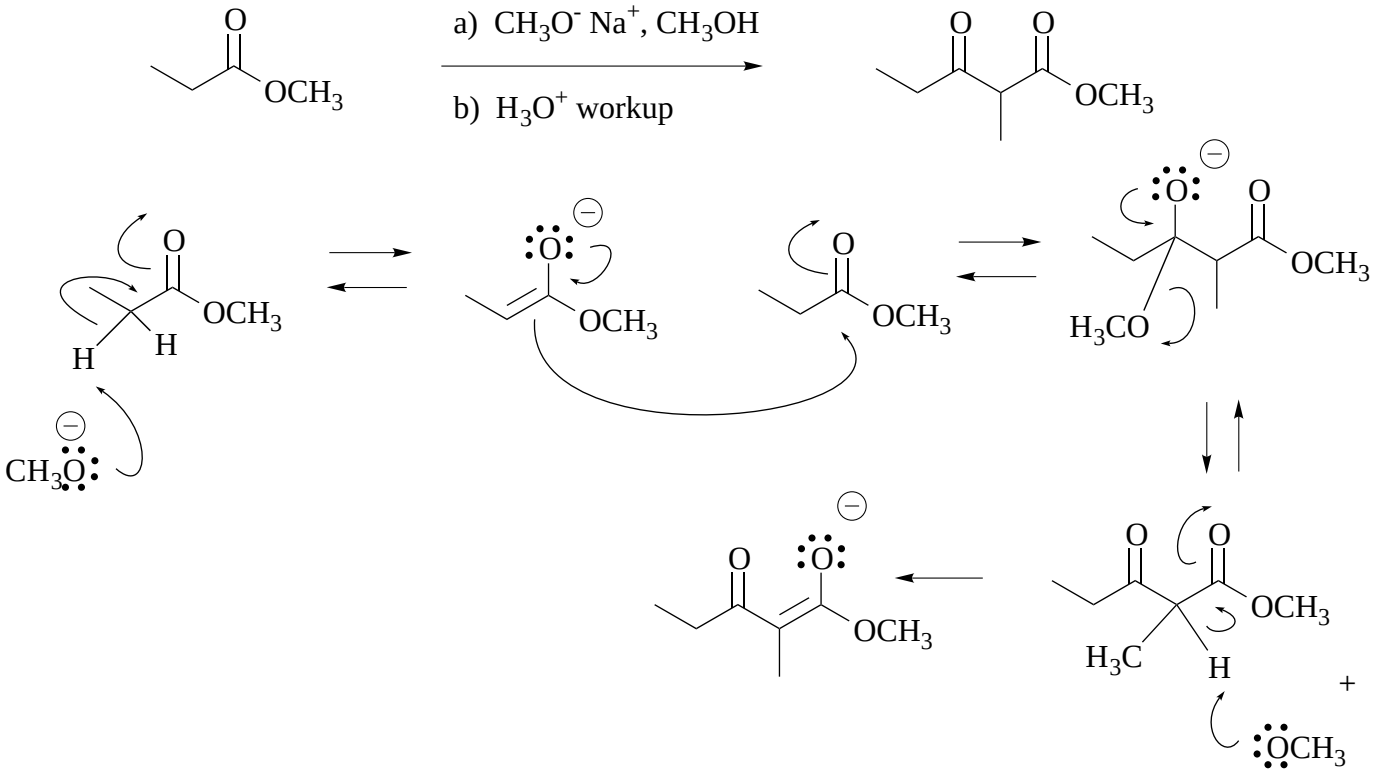
4 –continued-

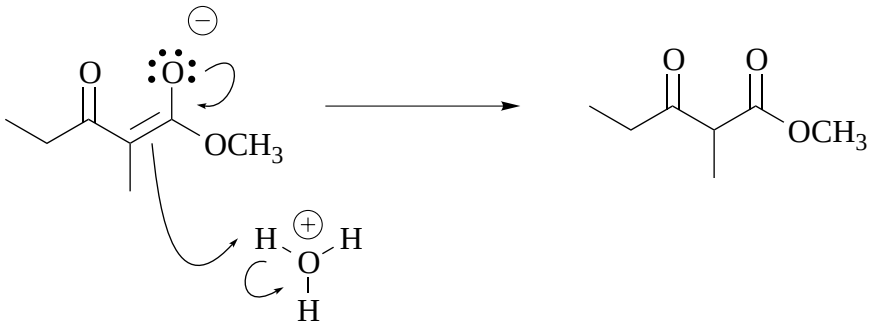
c) Propose a successful synthesis of hydroxyester **1** starting with hydroxyacid **2**.



2 **1**

d) Propose an arrow-pushing mechanism for the following transformation.





Name:_____Key_____

4 –continued-

e) Propose a mechanism for the following famous transformation.