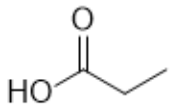
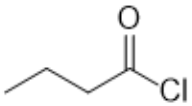
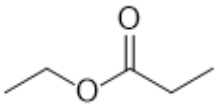
CHM 3150 Organic Chemistry II
Dr. Laurie S. Starkey, Cal Poly Pomona
Chapter 20 Carb. Acids & Derivatives Part 4
(& Exam Review) – Practice Problems

For clicker question voting, go to:
https://pollev.com/lauriestarke263

1 Provide the correct IUPAC name for each compound.

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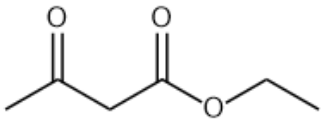
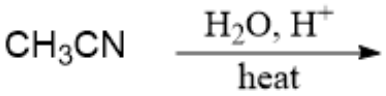


Predict the major product and provide the first three steps of the mechanism.
Provide a drawing for each name in choices A-E!

3



A) Formic acid

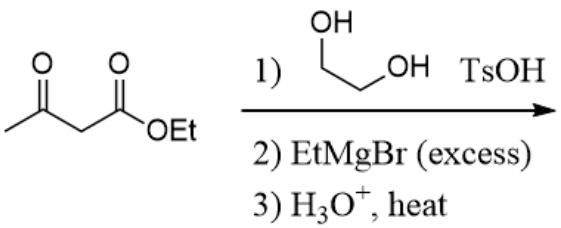
B) *N*,*N*-Dimethylformamide

C) Acetic acid

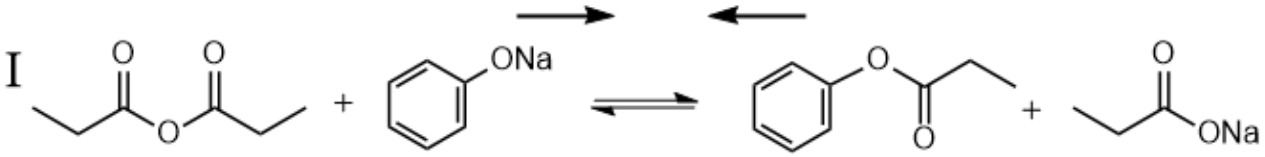
D) Hydroxyacetone

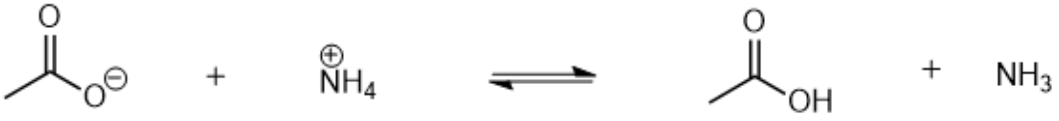
E) Acetamide

4



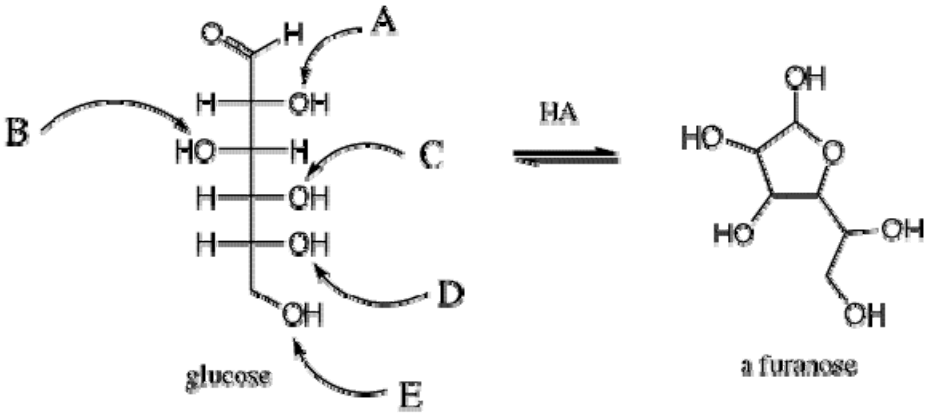
5 For each, predict whether the forward or reverse reaction is favored. Explain.

I 

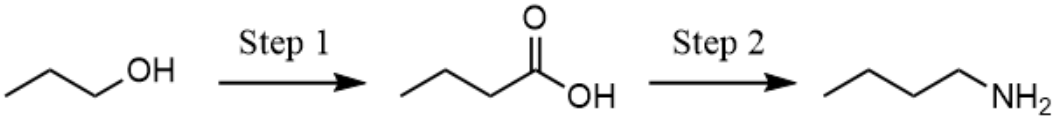
II 

III 

Which of the oxygen in glucose was involved in the cyclization to the furanose form shown?

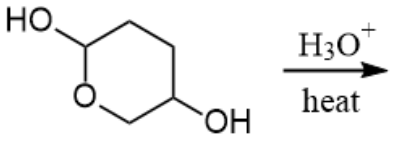
6 

7 Provide the necessary reagents.



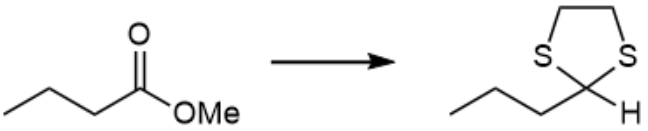
Predict the major product for the following reaction.

8



Provide the necessary reagents.

9



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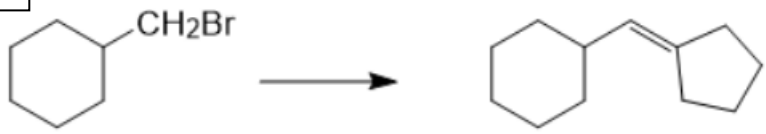
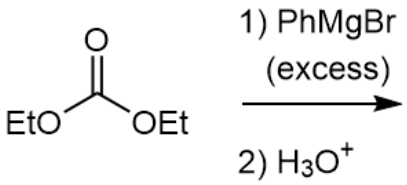


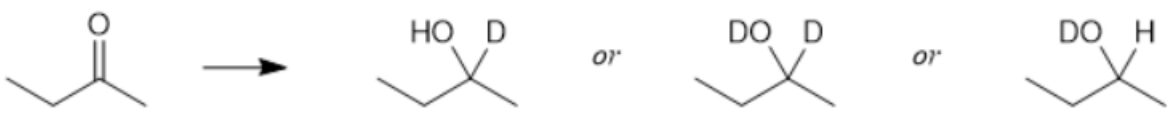
11

Predict the major product.



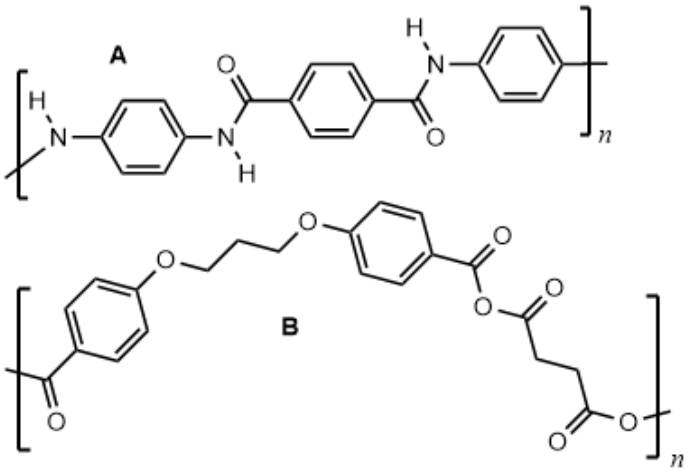
Synthesize the following compounds from 2-butanone, using $NaBH_4$, $NaBD_4$, H_2O, and D_2O as needed. Recall that deuterium (D) is an isotope of hydrogen (D = ^2H).

12

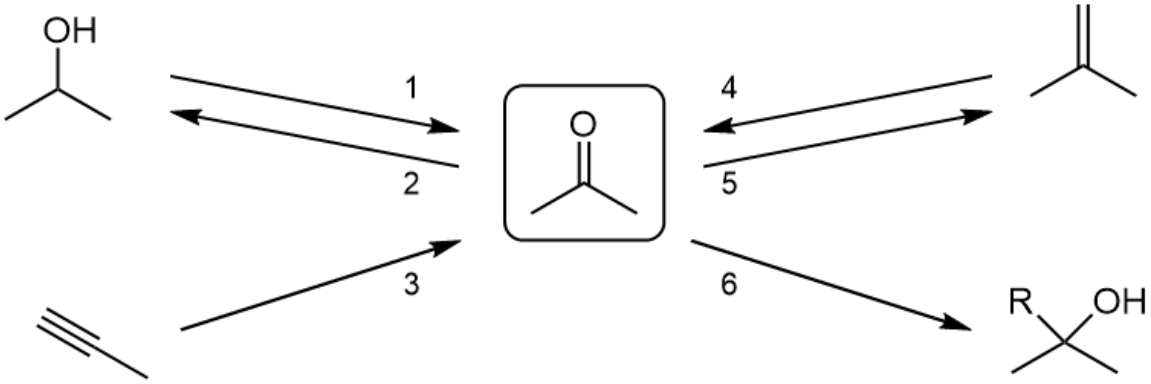


13

One of these polymers is very strong and durable (bulletproof vests) and the other is easily hydrolyzed (biodegradable). Identify each polymer and explain the difference in properties. What monomers could be used to make each polymer?



14 Provide the missing reagents (each transformation corresponds to one letter).



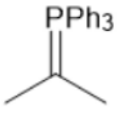
My solution: | | | | | | | (enter into PollEverywhere as one word, such as **abcde**)

1 2 3 4 5 6

Correct answer: | | | | | | |

A. t-BuOK

B. 1) RONa; 2) H_3O^+

C. 

D. ROH, TsOH

E. 1) $LiAlH_4$; 2) H_3O^+

F. 1) BH_3-THF; 2) H_2O_2, NaOH

G. MCPBA

H. H_2SO_4, H_2O, $HgSO_4$

I. conc. H_2SO_4, heat

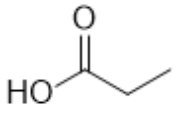
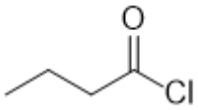
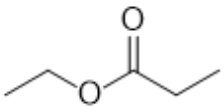
J. $Ph_3P{=}CH_2$

K. 1) RMgBr; 2) H_3O^+

L. $Na_2Cr_2O_7$, H_2SO_4, H_2O

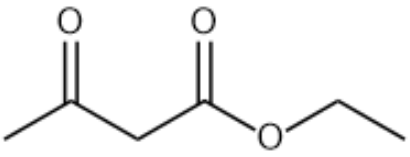
1

Provide the correct IUPAC name for each compound.

			
A)	1-oxo-1-propanol	1-chlorobutanal	1-ethoxypropanone
B)	propanic acid	butanyl chloride	propyl ethanoate
C)	propanoic acid	butanyl chloride	ethyl propanoate
D)	propanic acid	butanoyl chloride	propyl ethanoate
E)	propanoic acid	butanoyl chloride	ethyl propanoate

2

According to IUPAC rules, what is the name of the molecule shown?



A) ethoxy butanoic anhydride

B) ethoxy 1,3-butanedioate

C) ethyl 3-oxobutanoate

D) ethyl 3-ketobutanoate

E) 1-ethoxy-1,3-butanedione

3 $CH_3CN \xrightarrow[\text{heat}]{H_2O,\ H^+} CH_3CO_2H$

Which of the following best depicts the initial nucleophilic addition step in the acid-catalyzed hydrolysis of acetonitrile shown above?

Predict the major product,

$CH_3CN \xrightarrow[\text{heat}]{H_2O,\ H^+}$

A) Formic acid

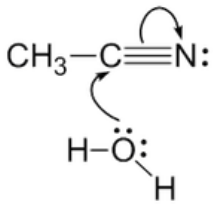
B) *N*,*N*-Dimethylformamide

C) Acetic acid

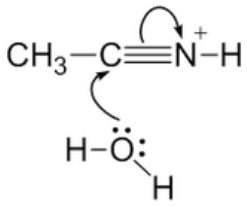
D) Hydroxyacetone

E) Acetamide

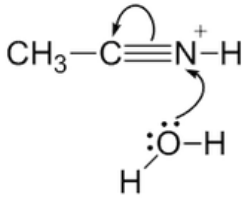
A)



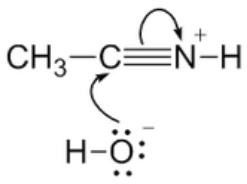
B)



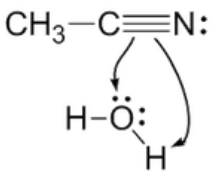
C)



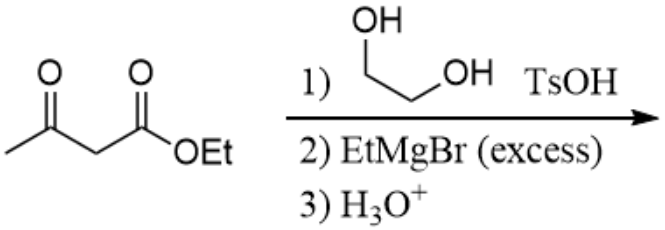
D)



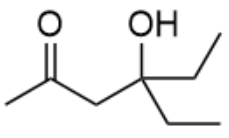
E)



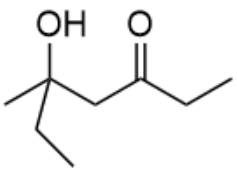
4 Predict the major product.



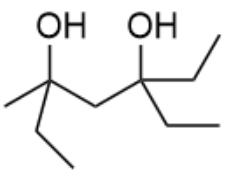
A)



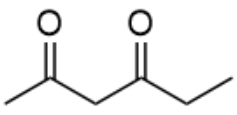
B)



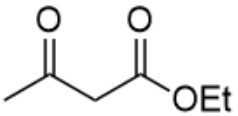
C)



D)



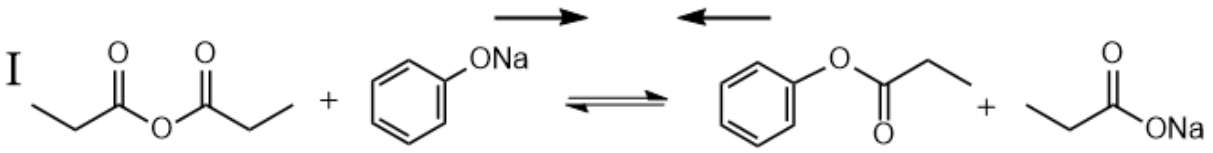
E)

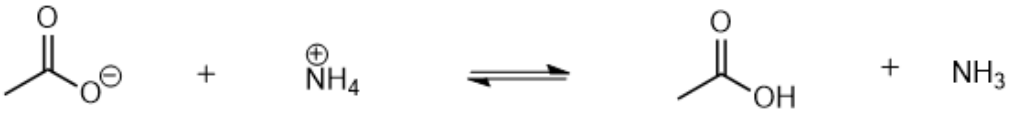


(no reaction)

5

For each, predict whether the forward or reverse reaction is favored. Explain.

I 

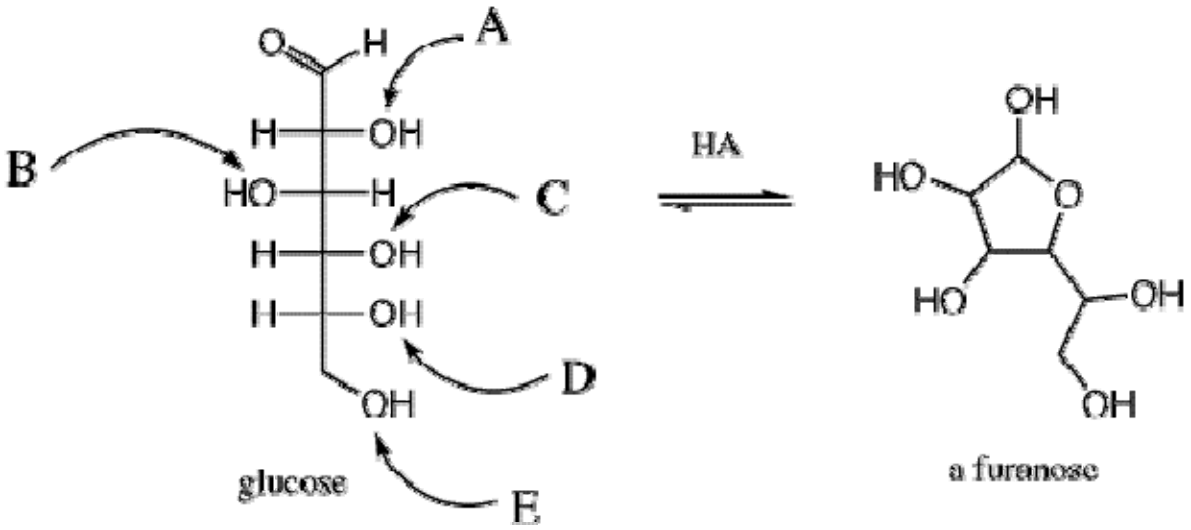
II 

III 

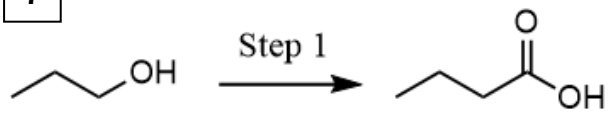
	A	B	C	D	E
I	→	→	←	←	neither
II	←	→	→	←	→
III	←	→	←	→	←

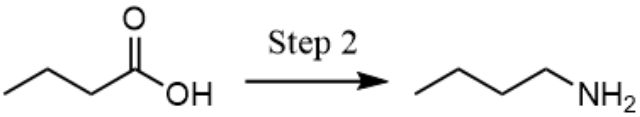
6

Which of the oxygen in glucose was involved in the cyclization to the furanose form shown?



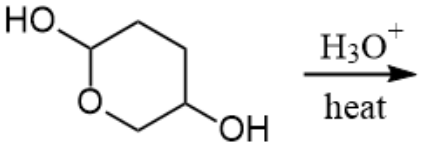
7



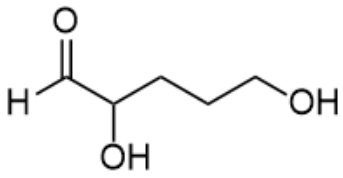


	Step 1	Step 2
A)	$Na_2Cr_2O_7$, H_2SO_4	1) $LiAlH_4$ (+ aq. workup) 2) NH_3 (xs)
B)	$Na_2Cr_2O_7$, H_2SO_4	1) NH_3 (xs) 2) $LiAlH_4$ (+ aq. workup)
C)	1) PBr_3 2) Mg 3) CO_2 (+ aq. workup)	1) $SOCl_2$, pyridine 2) NH_3 (xs) 3) $LiAlH_4$ (+ aq. workup)
D)	1) PBr_3 2) Mg 3) CO_2 (+ aq. workup)	1) $LiAlH_4$ (+ aq. workup) 2) NH_3 (xs)
E)	1) TMSCl, pyridine 2) NaCN 3) H_3O^+, heat	1) $SOCl_2$, pyridine 2) NH_3 (xs) 3) $LiAlH_4$ (+ aq. workup)

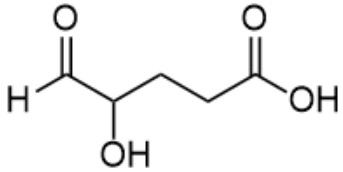
8 Predict the major product for the following reaction.



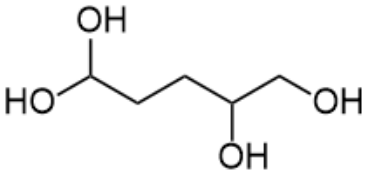
A)



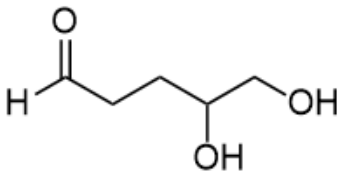
B)



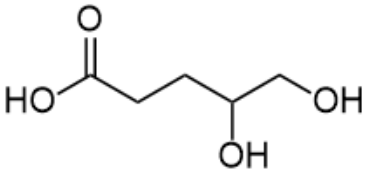
C)



D)

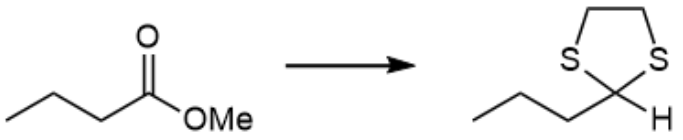


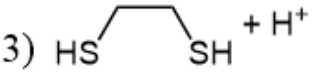
E)

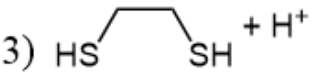


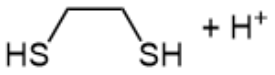
Provide the necessary reagents.

9

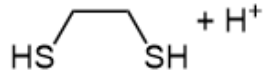


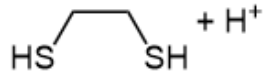
A) 1) $LiAlH_4$; workup
2) $Na_2Cr_2O_7$, H_2SO_4
3) 

B) 1) $LiAlH_4$; workup
2) PCC
3) 

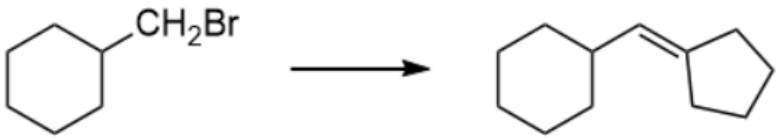
C) 1) 

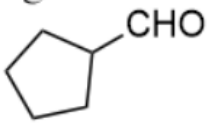
2) $LiAlH_4$; workup

D) 1) $LiAlH_4$; workup
2) 

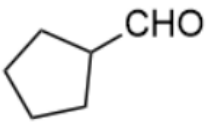
E) 1) $NaBH_4$; workup
2) 

10 Which reagents would be best to achieve the following synthesis?

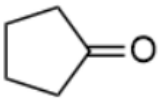


A) 1) Mg
2) 

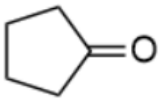
3) conc. H_2SO_4, heat

B) 1) $Ph_3P{=}CH_2$
2) 

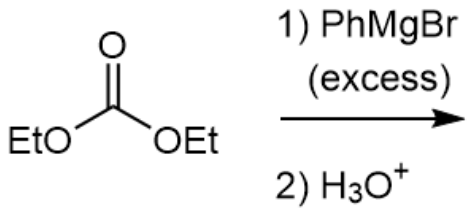
3) conc. H_2SO_4, heat

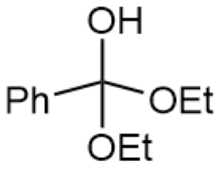
C) 1) Mg
2) 

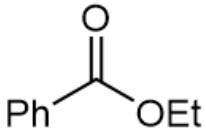
3) conc. H_2SO_4, heat

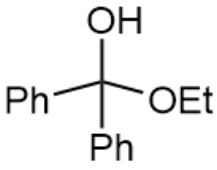
D) 1) Ph_3P
2) BuLi
3) 

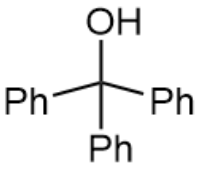
11 Predict the major product.

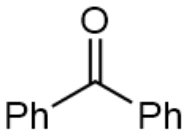


A) 

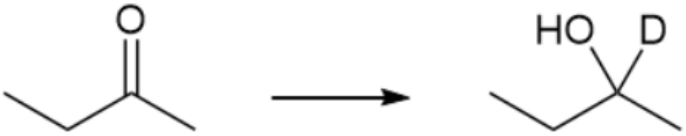
B) 

C) 

D) 

E) 

12 Which reagents would be best to achieve the following synthesis?

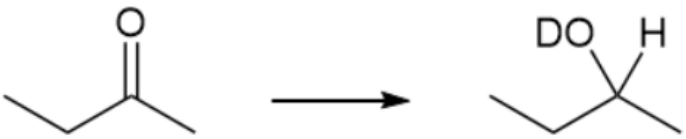


A) 1) $NaBH_4$
2) H_3O^+

C) 1) $NaBD_4$
2) H_3O^+

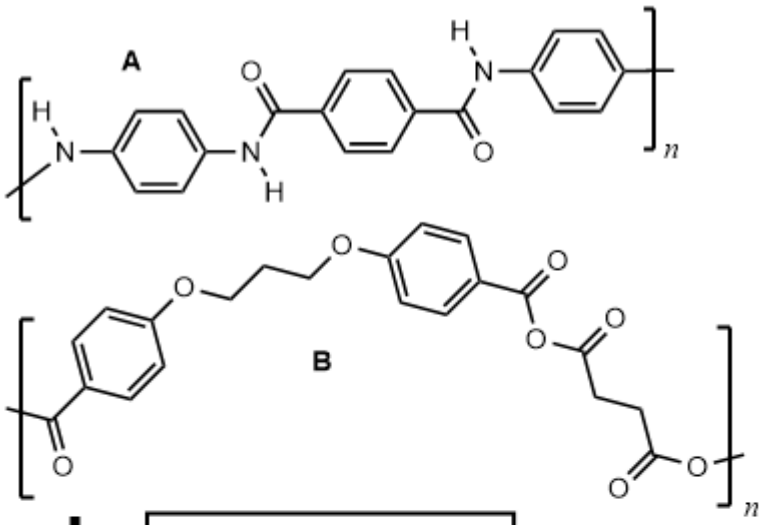
B) 1) $NaBH_4$
2) D_3O^+

D) 1) $NaBD_4$
2) D_3O^+



13

One of these polymers is very strong and durable (bulletproof vests) and the other is easily hydrolyzed (biodegradable). Identify each polymer and explain the difference in properties. What monomers could be used to make each polymer?



Strong & Durable	**Biodegradable**
A) **A** because amide bonds are flexible	**B** because oxygen atoms make the polymer polar
B) **A** because amide C=O is electron-rich and can form H-bonds	**B** because anhydrides have good LG's
C) **B** because oxygen atoms make the polymer polar	**A** because amide C=O is electron-rich and can form H-bonds
D) **B** because anhydrides have good LG's	**A** because amide bonds are flexible