CHM 234, Spring 2018

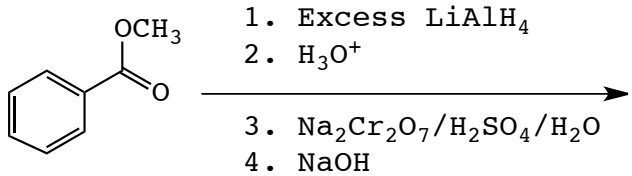
QUIZ #5 ANSWER KEY

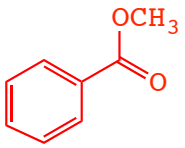
(hit the RETURN Button to return to the Main Quiz Page)

QUESTION 1

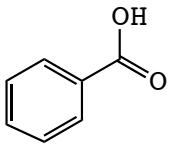
MC29f

Give the product of the following reaction sequence with the starting material shown

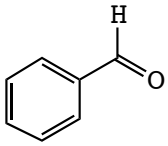




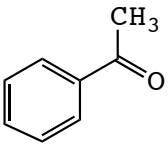
A



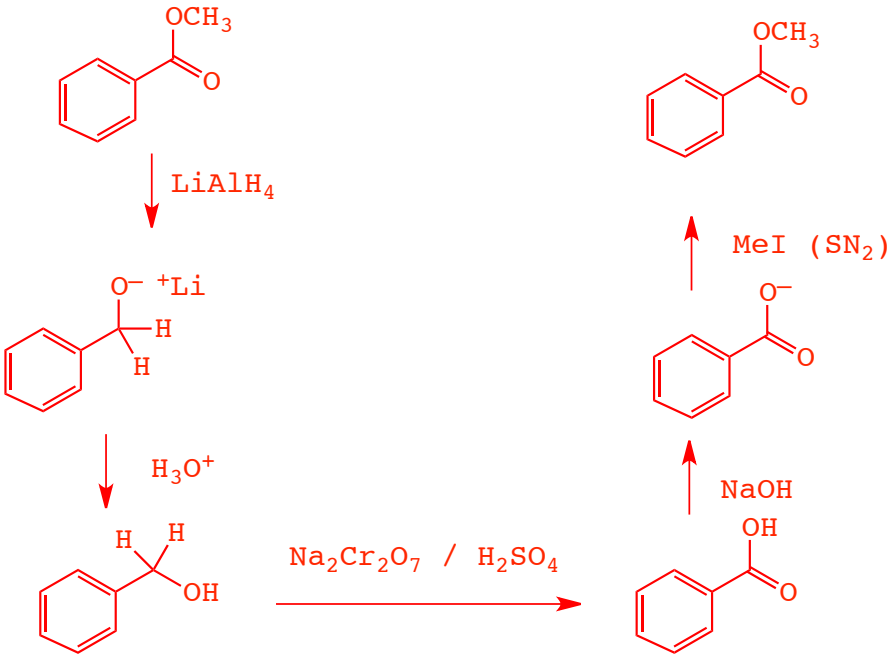
B



C



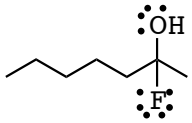
D

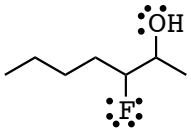


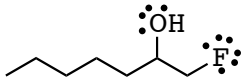
QUESTION 2

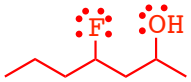
MC29o

Which is the WEAKEST Bronsted acid?

A 

C 

B 

D 

Bronsted acids donate a proton, so first we must identify the hydrogen atom that is most likely to be lost as a proton, i.e. the most acidic hydrogen atom on the molecule. The proton attached to the oxygen will leave behind a negative charge on oxygen, whereas all other protons will leave behind a negative charge on carbon, the charge on oxygen is preferred because oxygen is more electronegative. An extra pair of non-bonding electrons are lower in energy on a more electronegative element, the electrons are lower in energy, the anion is most stabilized, the anion is easiest to form energetically

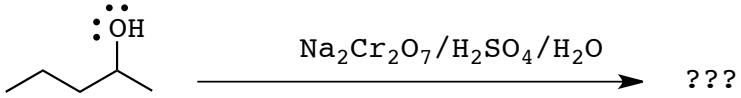
The anion formed upon deprotonation at oxygen in all of these alcohols is further stablized by the very electronegative fluorine due to the INDUCTIVE effect. The inductive effect "pulls" electrons through sigma bonds towards electronegative elements. The electrons are "pulled" towards electronegativ elements because in doing so their energy is lowered as a consequence of the concentrated positive charge at the nucleus

the INDUCTIVE effect decreases rapidly with distance. In D, the fluorine is farthest away from the negative charge on the oxygen, thus it stabilizes the charge the least, making the non-bonding electrons in anion from D highest in energy, this anion is thus hardest to form, its alcohol is thus the weakest Bronsted acid

QUESTION 3

MC29t

Identify the following reaction as indicated
(stereochemistry is ignored)

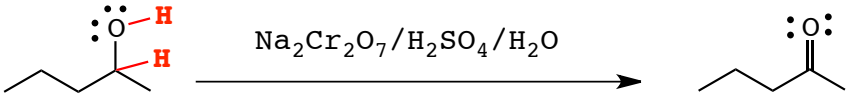


A **addition** and **neither oxidation or reduction**

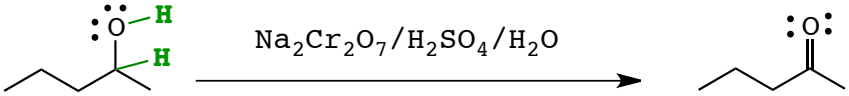
B **elimination** and **neither oxidation or reduction**

C **addition** and **reduction**

D **elimination** and **oxidation**



this is an OXIDATION of the alcohol, 2 H atoms are REMOVED

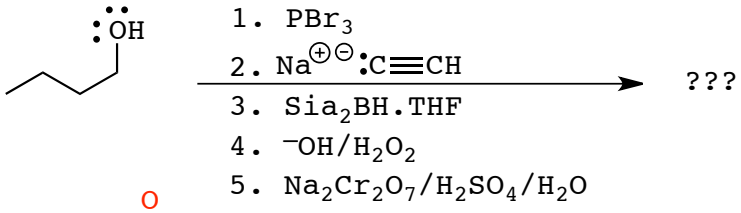


this is also clearly an ELIMINATION reaction, the 2 H atoms indicated in GREEN were REMOVED to form the C=O bond

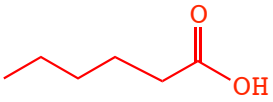
QUESTION 4

MC29u

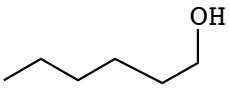
gove the product of the following reaction sequence



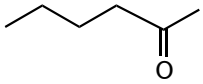
A



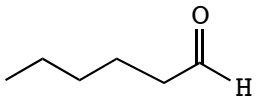
B

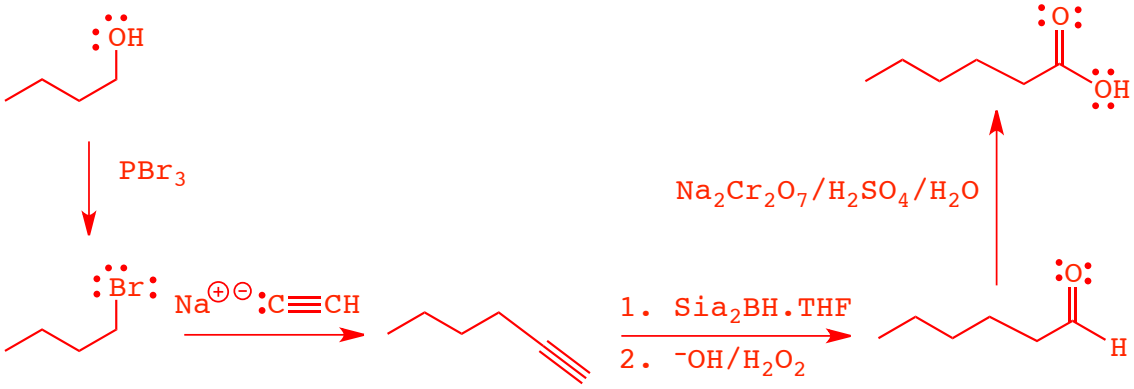


C



D

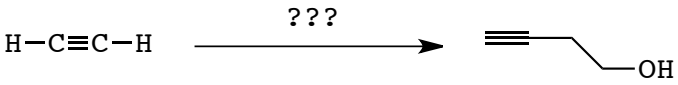




QUESTION 5

MC29u

Give the reagents/conditions to perform the following reaction



A

1. $NaNH_2$
2. 
3. H_3O+

C

1. $NaNH_2$
2. 
3. H_3O+

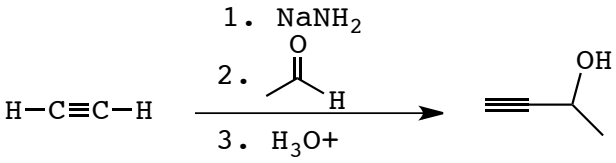
B

1. $NaNH_2$
2. 
3. H_3O+

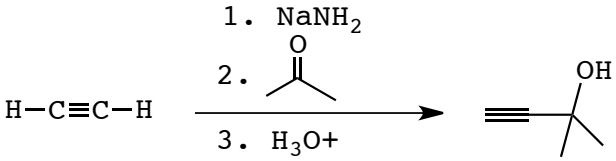
D

1. $NaNH_2$
2. 
3. H_3O+

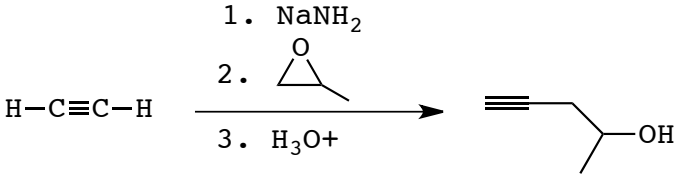
A



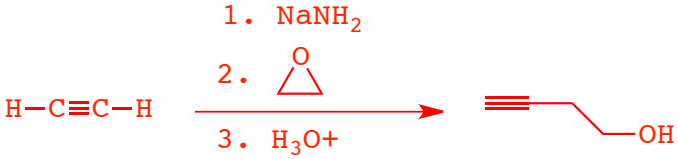
B



C



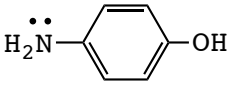
D

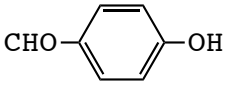


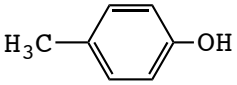
QUESTION 6

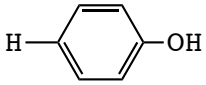
MC29w

rank the following in order of DECREASING Bronsted acidity

I 

III 

II 

IV 

A III > IV > II > I

B IV > II > III > I

C IV > III > I > II

D I > II > IV > III

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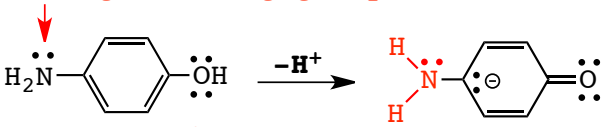
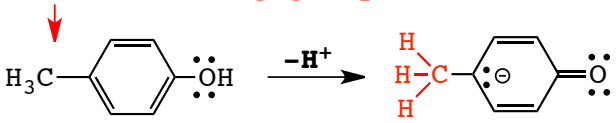
strong donating group



weakest acid

anion very DEstabilized
by strong electron donating group

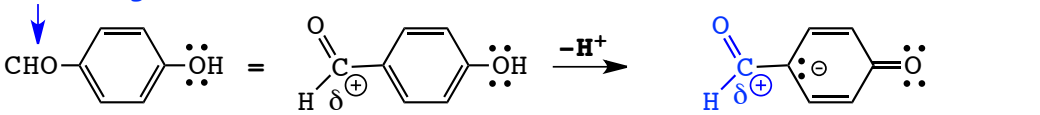
weak donating group



2nd weakest acid

anion somewhat DEstabilized
by weak electron donating group

Withdrawing

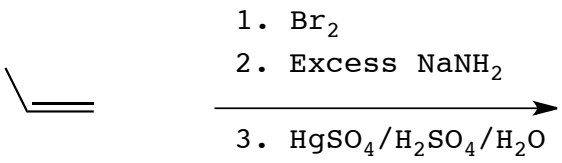


strongest
acid

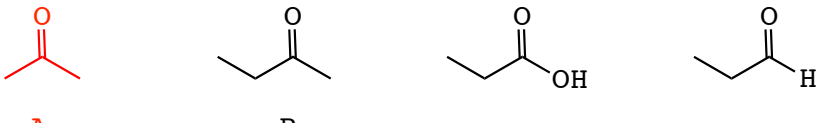
anion stabilized
by electron withdrawing group

QUESTION 7

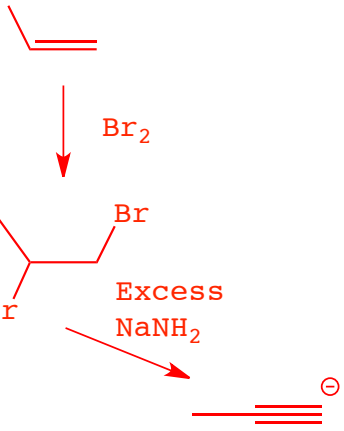
Which is the product of the following reaction sequence?



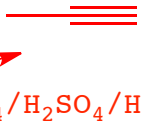
MC28d



A B C D

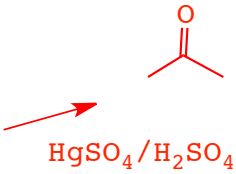


standard synthesis of an alkyne from a dihalide except that water is NOT added in a second work-up step, and so the Na+ salt of the acetylide is the final product



$HgSO_4/H_2SO_4/H_2O$

first thing that happens is simply protonation of the acetylide, this is aqueous acid after all



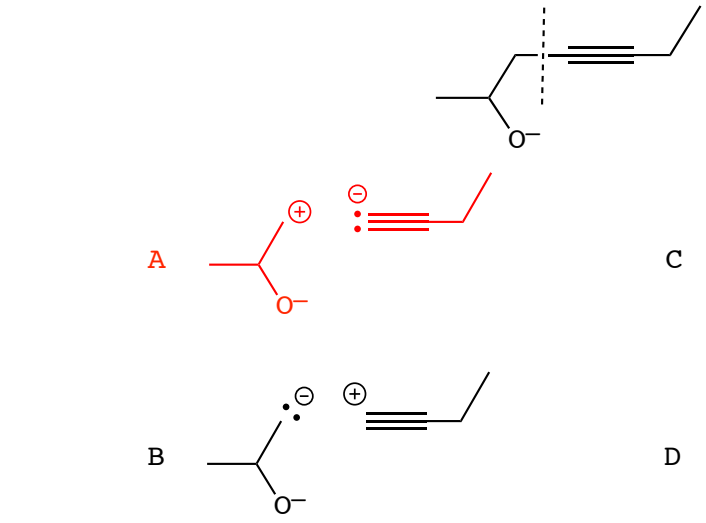
$HgSO_4/H_2SO_4/H_2O$

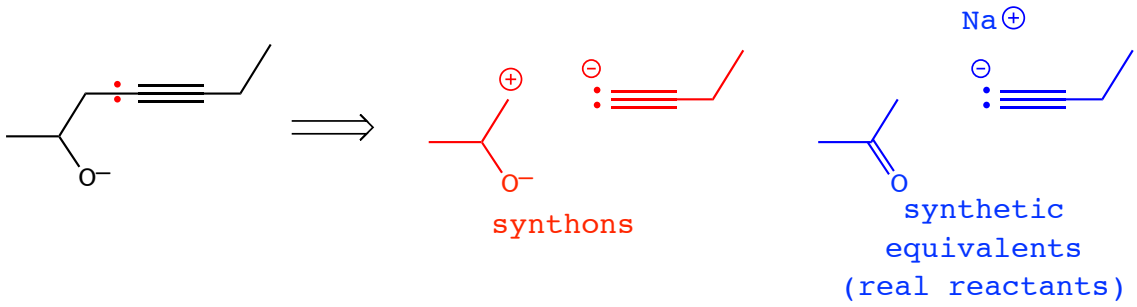
then the reaction in the notes that converts a terminal alkyne into a ketone

QUESTION 8

MC28n

Which are the best synthons for disconnection of the bond indicated by the dashed line?





Retrosynthetic analysis involves disconnection to two fragments (break the bond under consideration). Consider the two atoms that used to be bonded in the two fragments. One of these must carry the pair of electrons that will be used to "make" the bond again, going "backwards". The electron pair is best located on the atom where they will be most stable, since this fragment will be most easy to convert into a real reagent that isn't too different from the synthon. In this case, put the electrons on the sp hybridized carbon, and not on the otehr carbon, which is sp3 hybridized and is also adjacent to a negatively charged oxygen