

Alkynes

Naming

geometrically correct
and the dots (•) identify
sp hybridized carbons.

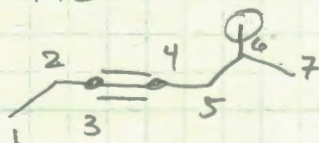
also drawn

OR

geometrically
incorrect BUT
easier to count
carbons

① Number longest chain that includes the
alkyne functional group

② Start numbering from one end of the
structure so the alkyne functional group gets
the lowest number



3-heptyne
position of first C
of $\text{C}\equiv\text{C}$
3 4

'yne' suffix to indicate
alkyne molecule

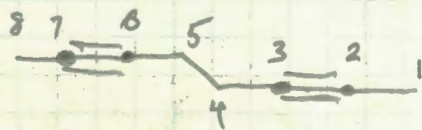
'hept' prefix indicates 7 C
chain

③ Indicate the substituents and their numerical location
6-methyl (circled above)

④ Name

6-methyl-3-heptyne

Name



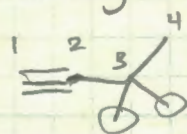
numbering could start from either end because both approaches would
place lowest numbering identically

2,6-octadiyne

two alkyne groups

"alka" prefix includes the last 'a' ∴ octa

Naming



1-butyne

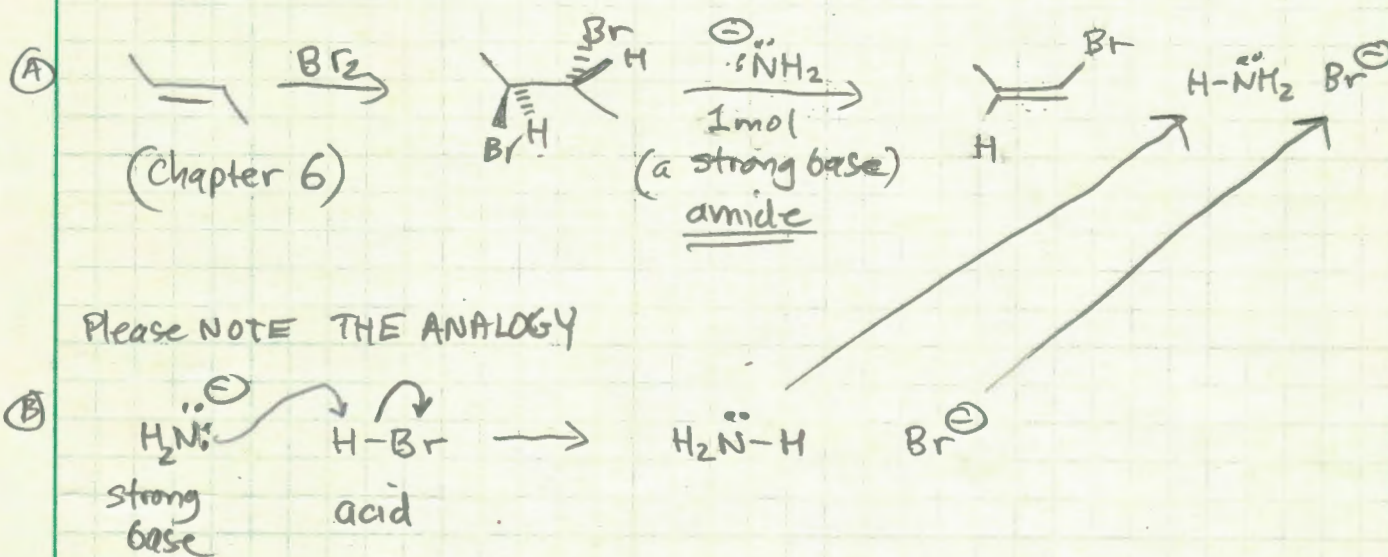
methyl substituents circled above

3,3-dimethyl

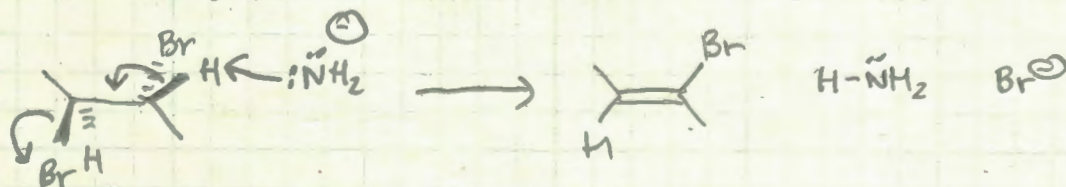
3,3 tells where each of the two CH_3 group is. One is at position 3, and so is the other.

3,3-dimethyl-1-butyne

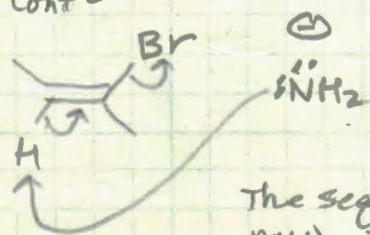
Preparing Alkynes from dihalo alkanes.



However, in reaction (A) the H and Br flank a C-C bond and when H is removed the C-H electrons move between the C-C to form a C=C and the C-Br electrons move out to Br



Cont'd

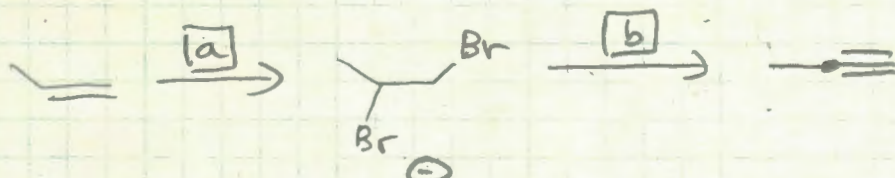


2-butyne



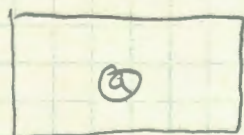
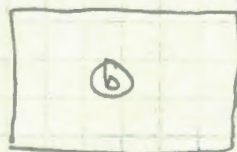
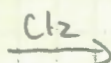
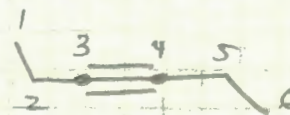
The sequence repeats with a 2nd mol of NH_3 , but now the $\text{C}=\text{C}$ electrons move between a $\text{C}=\text{C}$ to form $\text{C}\equiv\text{C}$ and the $\text{C}-\text{Br}$ electrons move out to Br.

Preparation (Add the reactants)



(a) Br_2 (b) 2 mol :NH_3

→ this is important because 2 Hs and 2 Br^- need to be removed.

 C_6H_{12}  $\text{C}_6\text{H}_{12}\text{Cl}_2$ 

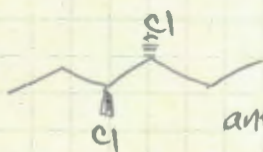
The product has 6 Cs and so do the previous compound that lead to it

(a) has 1 IHD, thus likely a double bond $\text{C}=\text{C}$ and NOT a ring since the product has NO ring.



3-hexene : seems like a reasonable start to make 3-hexyne.

(b) The formula tells me it's a dichloro compound that comes from an alkene and leads to an alkyne. I ask myself what does Cl_2 do to and 3-hexene

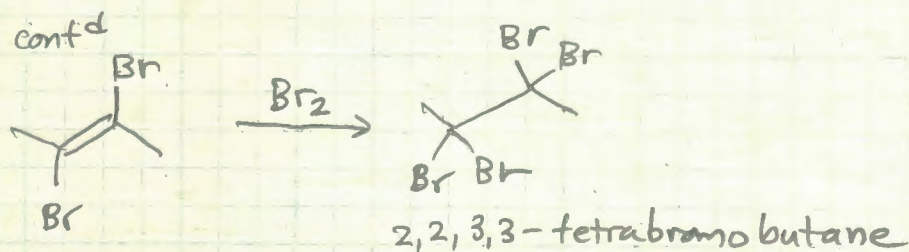
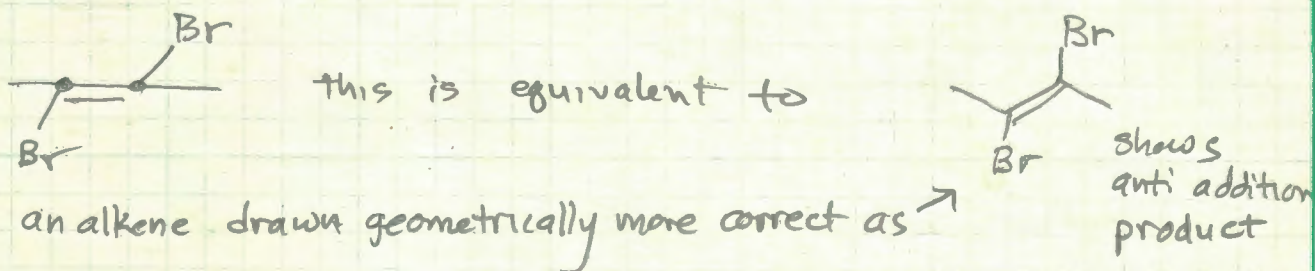
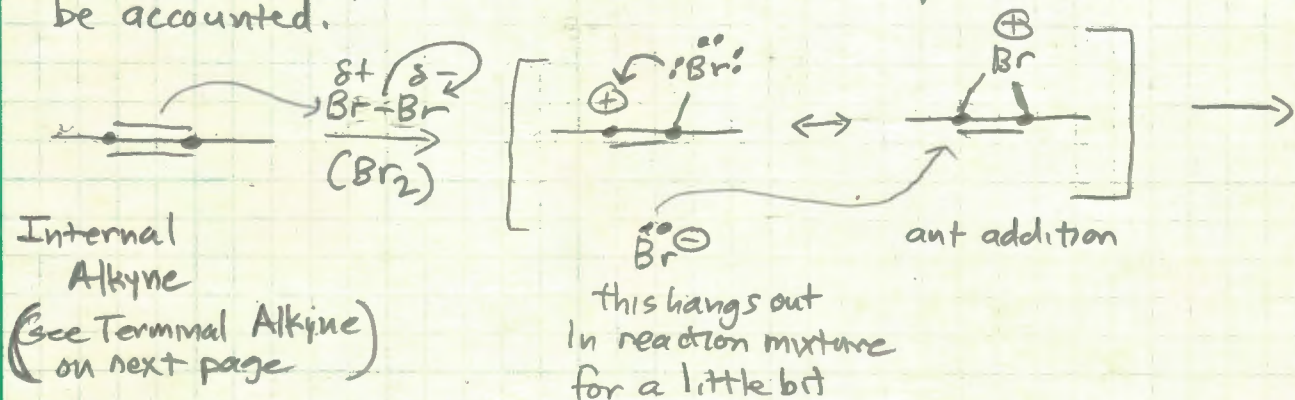


anti addition product

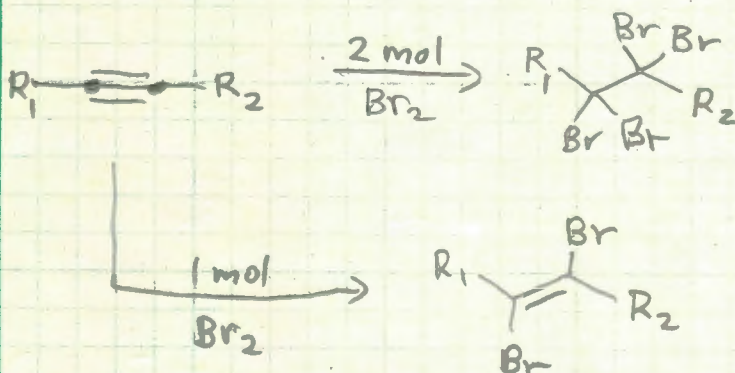
(c) How do I remove 2 Hs and 2 halos (Chloros in this case) from a dichloro alkane
2 mol :NH_3

Alkyne Addition Reactions

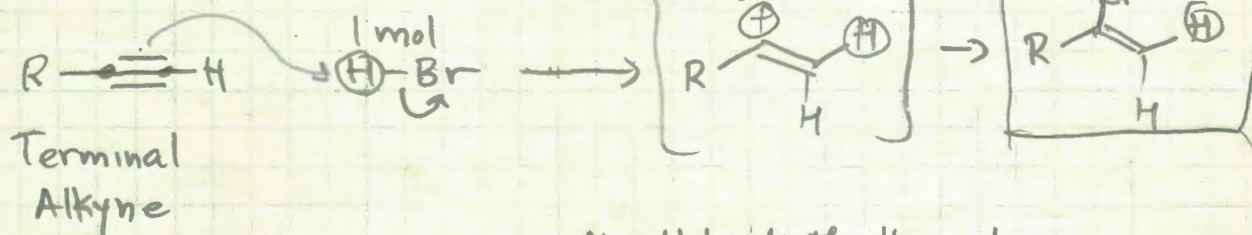
-these addition reactions are similar to those described for alkenes except, the extra π bond in the product needs to be accounted.



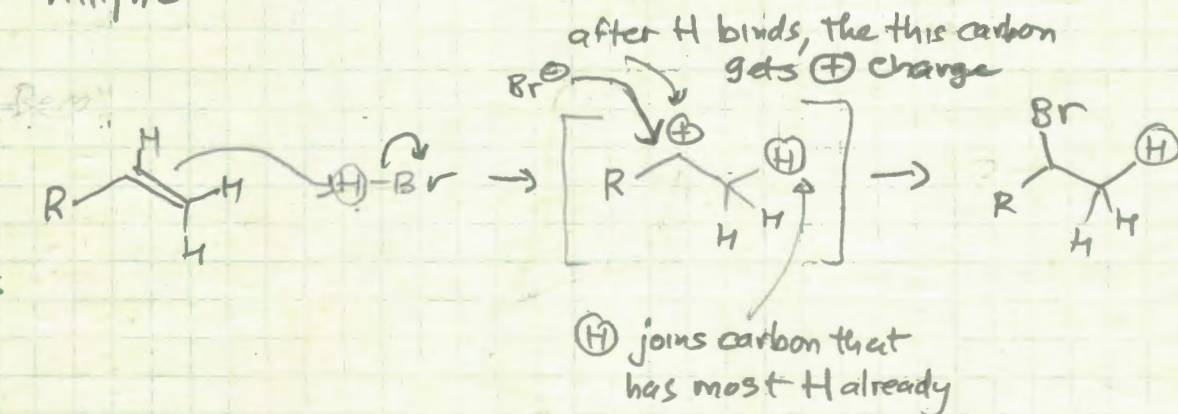
Summary



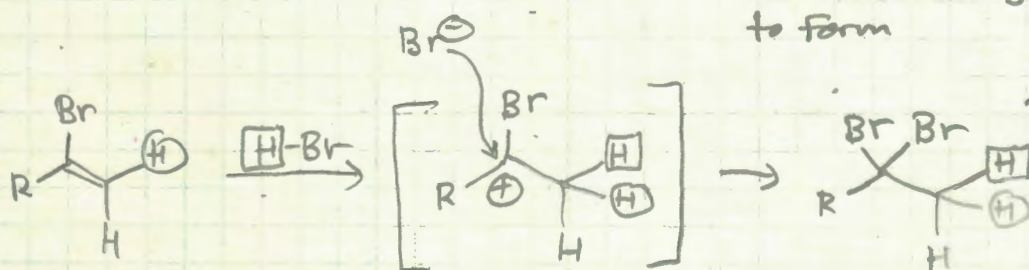
H-Br addition



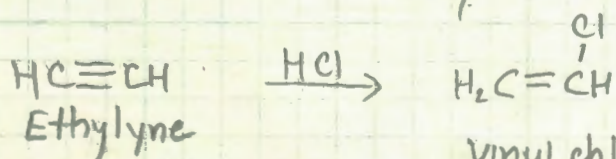
RECALL
for Alkene



Br⁻ is waiting for the ⁺ charge to form

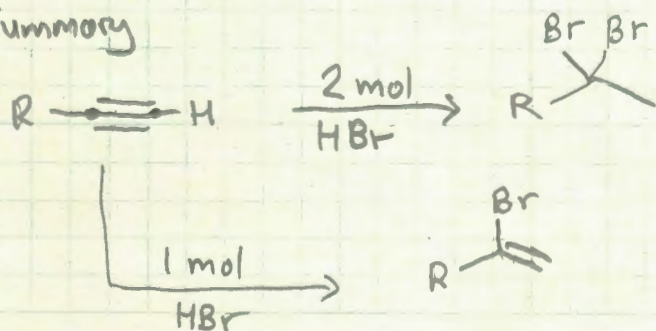


Practicality: make PVC - polyvinylchloride used to make the pipe used in many houses.

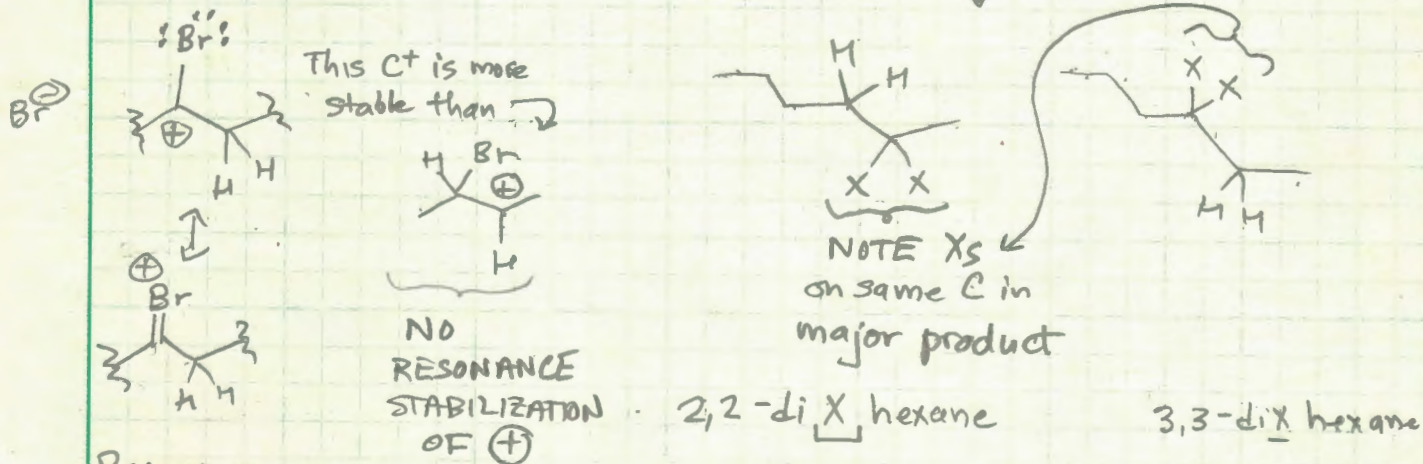
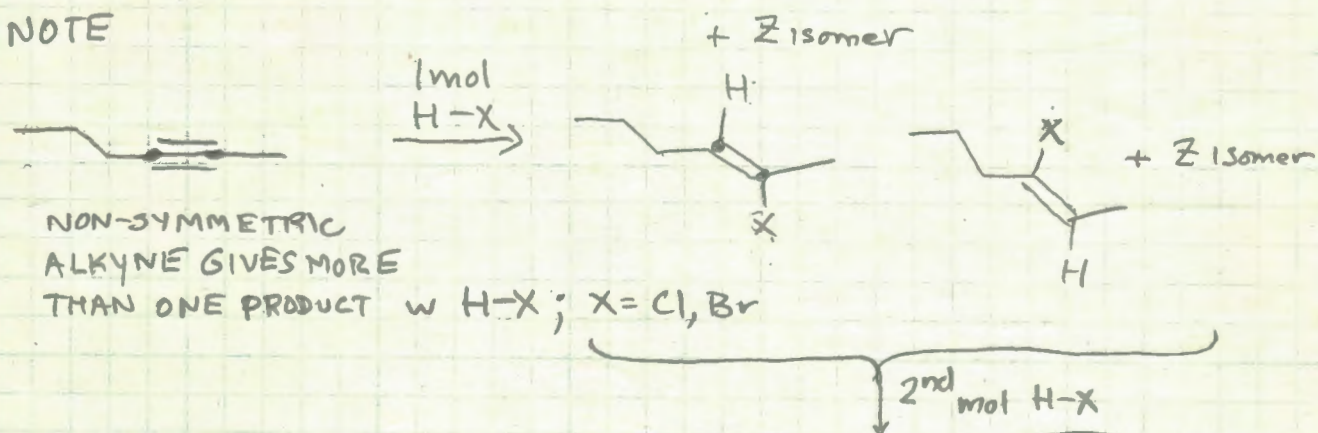


vinyl chloride - this is polymerized to make PVC.

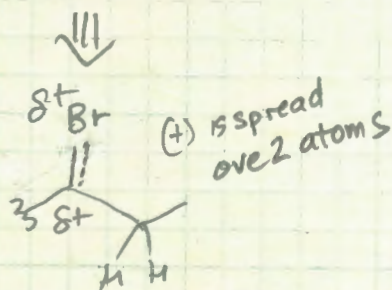
Summary



NOTE

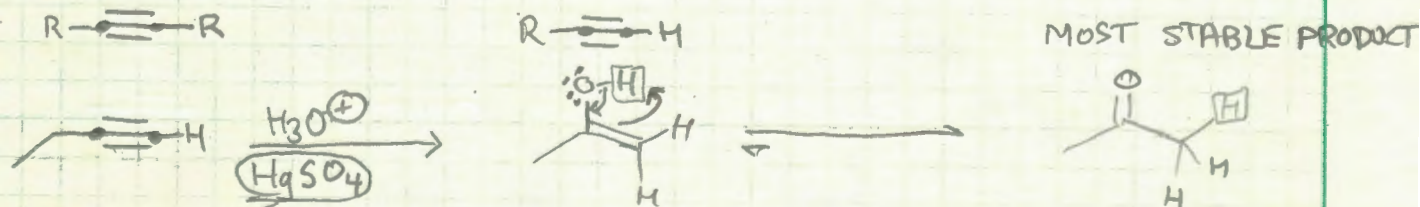


Resonance Stabilized Carbocation



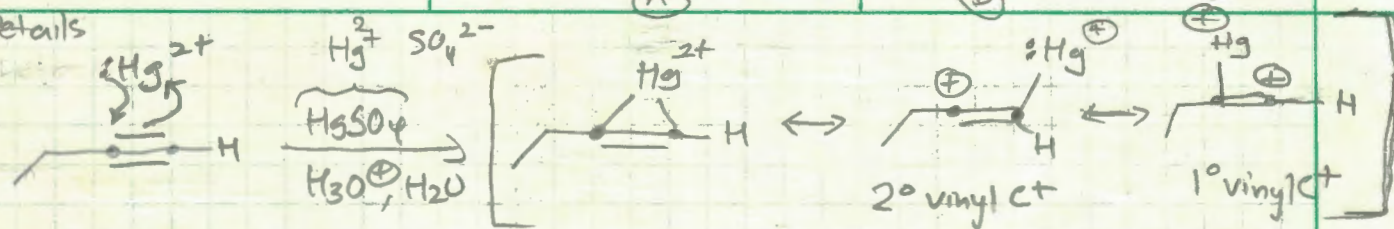
H-OH Addition

Internal Alkynes and Terminal Alkynes



This is needed because π -bonds of $C \equiv C$ are not as reactive as those in a $C = C$

Details



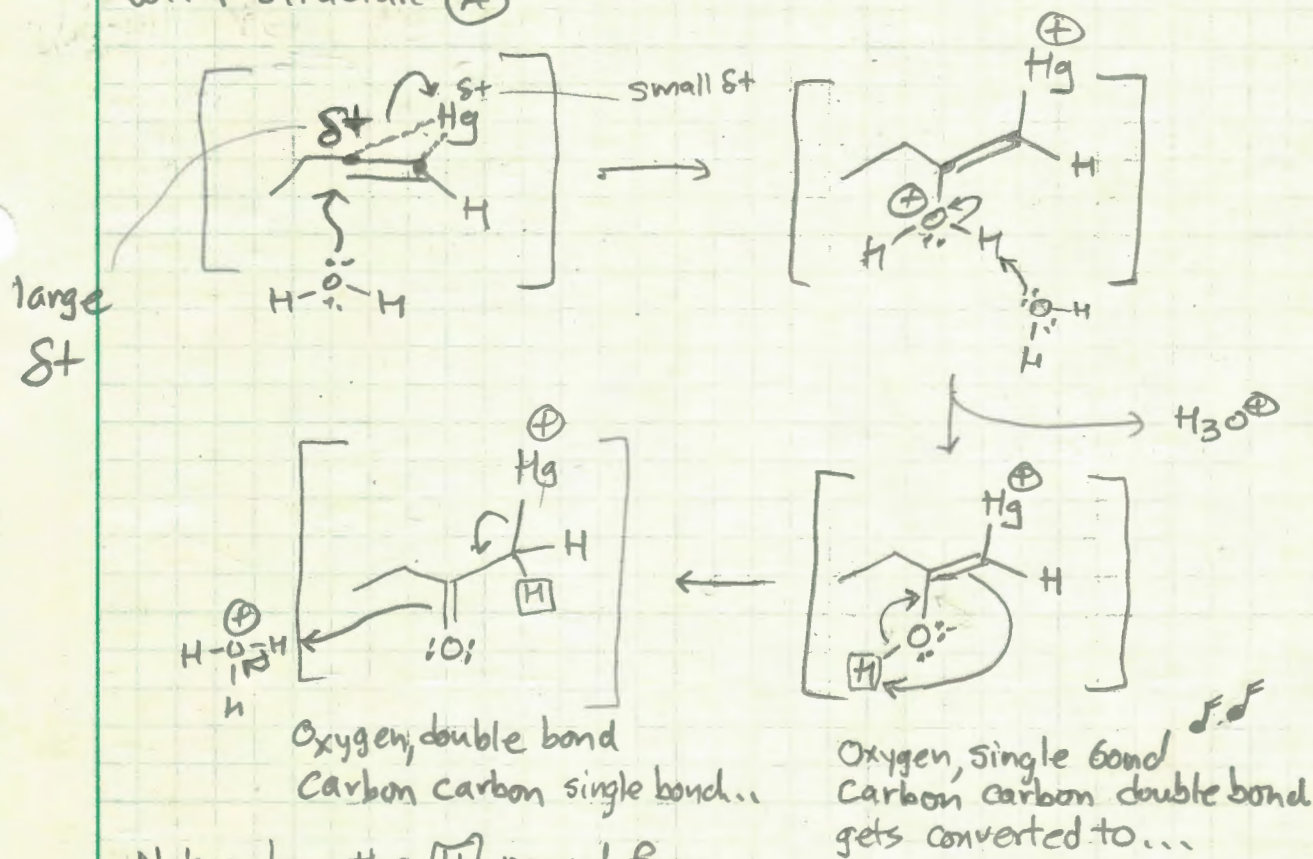
NOTE

A 2° vinyl c+ is more stable than a 1° vinyl c+

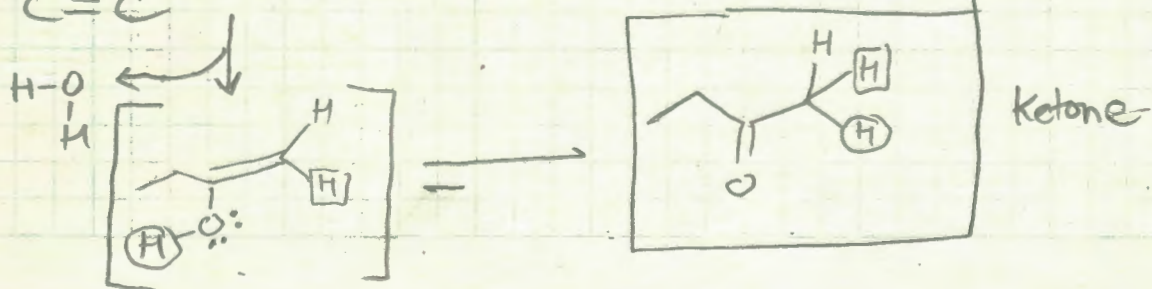
∴ Resonance structure (B) above is more representative of the carbocation intermediate

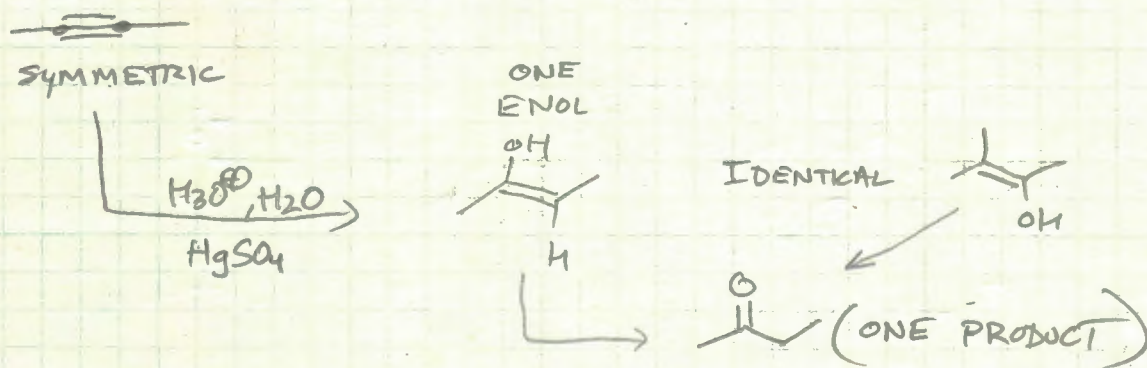
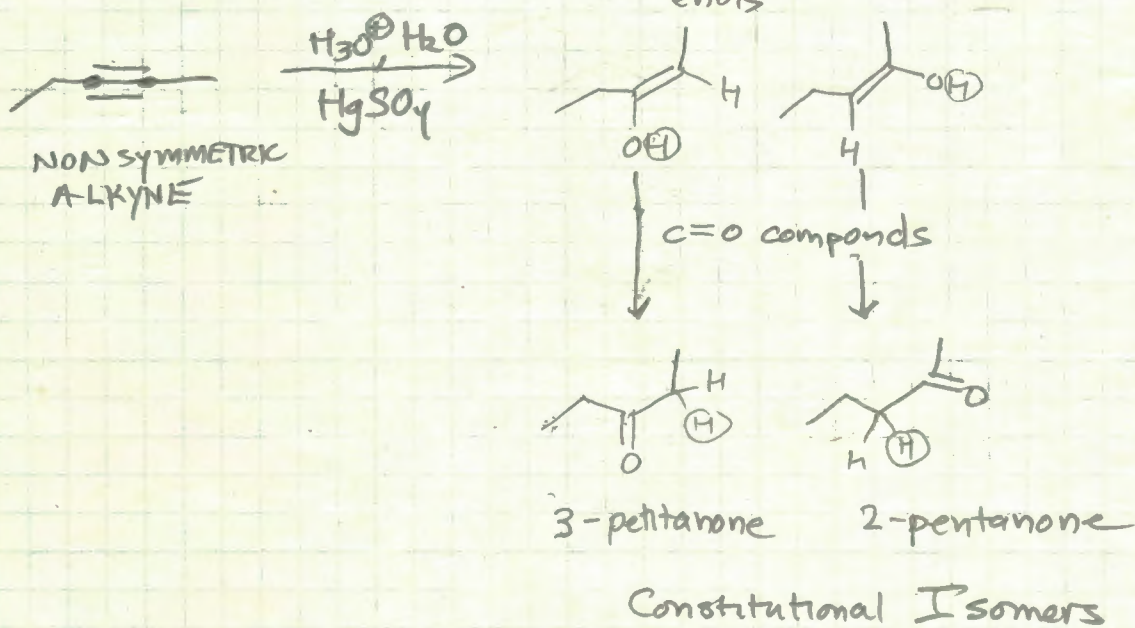
The (+) charge tells the chemist where the $\text{H}-\ddot{\text{O}}-\text{H}$ will "land".

Resonance structure (B) is more accurately drawn in combination with structure (A)



Notice how the [H] moved from the oxygen to the furthest C of the $\text{C}=\text{C}$

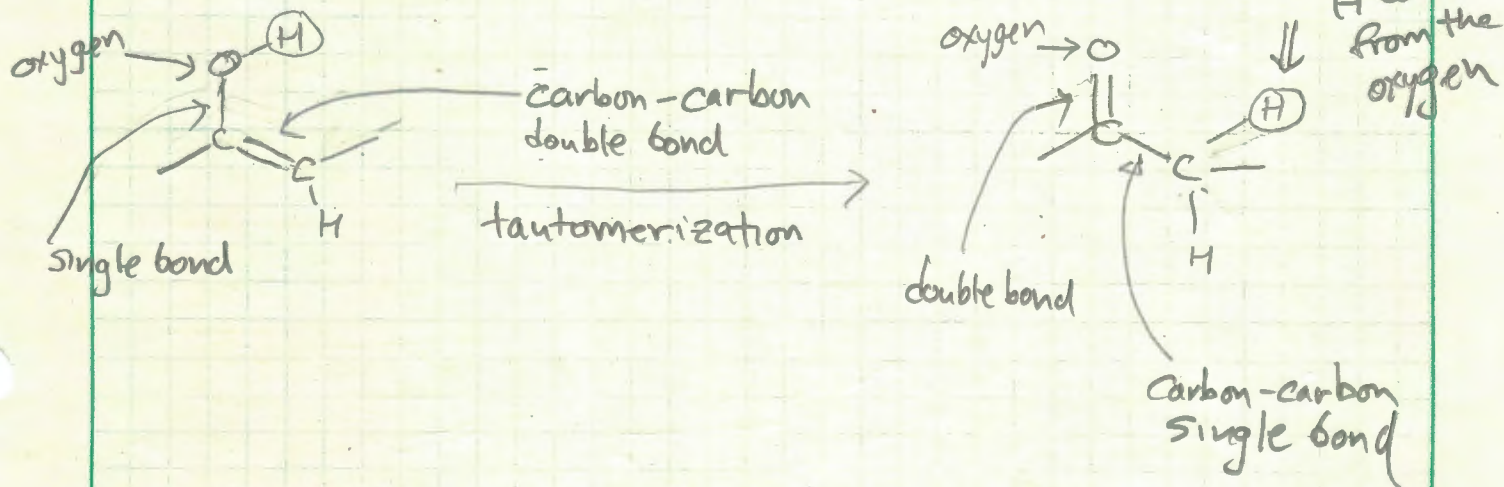




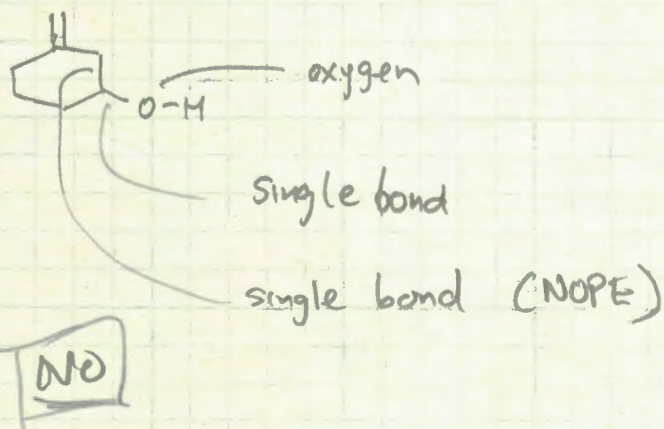
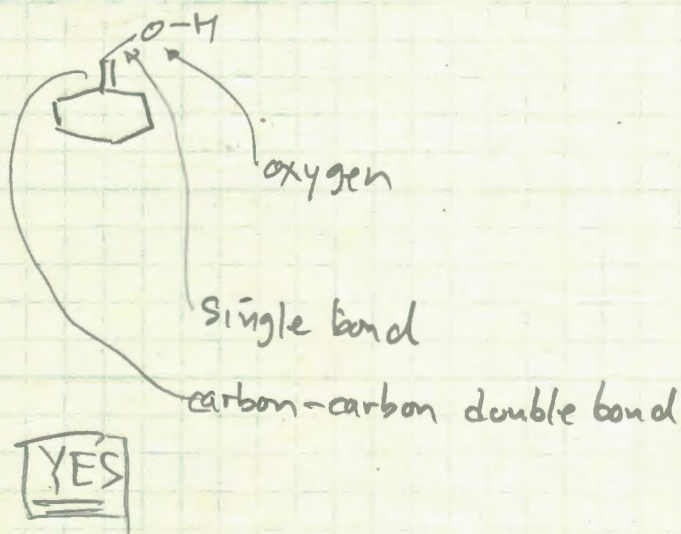
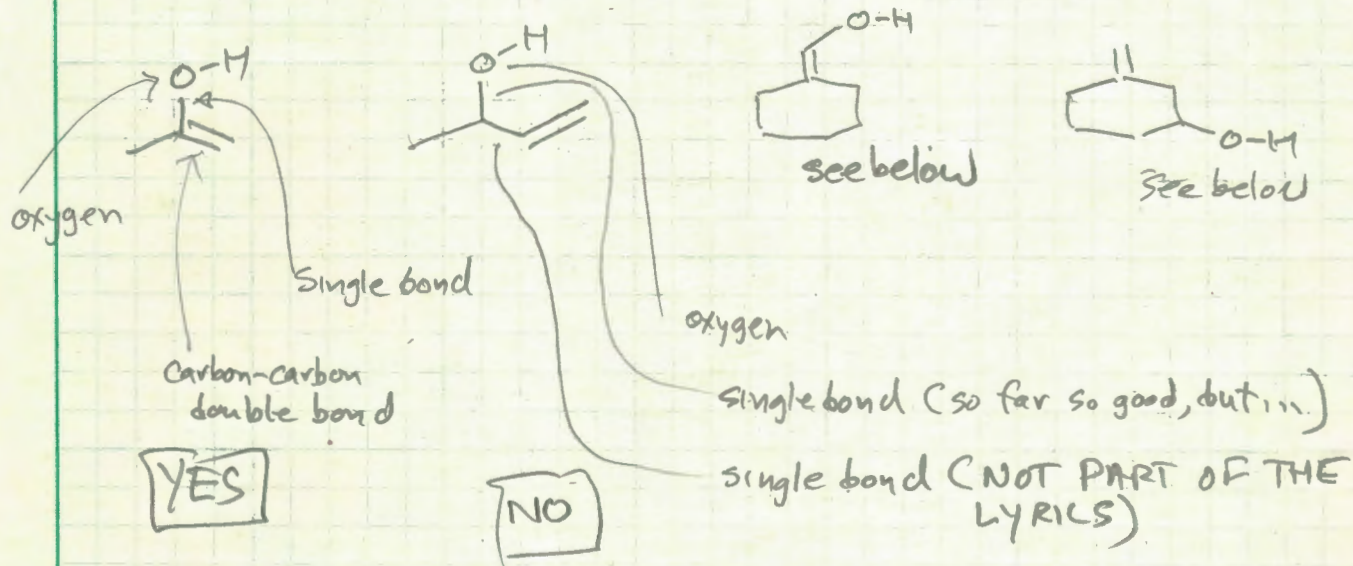
Time to "SING"

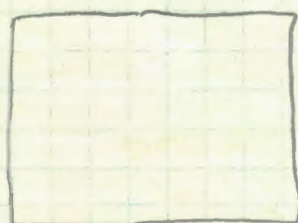
oxygen, single bond // carbon-carbon double goes to...

oxygen, double bond // carbon-carbon single bond.

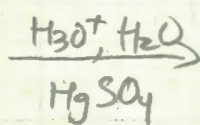


The following are ALL enols, but which of them can tautomerize to their $C=O$ tautomer.



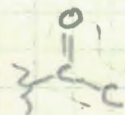


an alkene



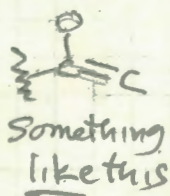
① You need an alkene that gives the ketone product

Work backward from both possible

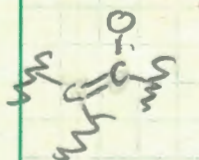


oxygen, double bond
carbon-carbon single bond to

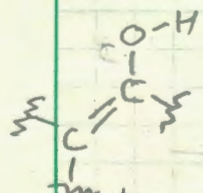
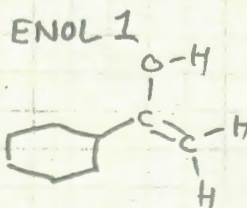
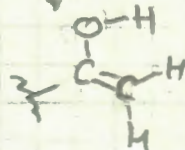
oxygen, single bond
carbon-carbon double bond



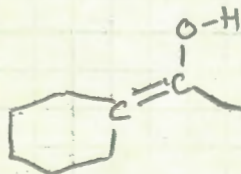
NOW FILL IN THE MISSING H



something like this



ENOL 2

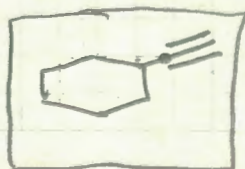


WE KNOW $\text{H}_3\text{O}^+, \text{H}_2\text{O}$ adds H, OH
 HgSO_4

$\rightarrow$ across a $\text{C}\equiv\text{C}$, only

ENOL 1 above has an H on one C and an OH on the other

$\therefore$ The Alkyne is



NOT, A BIG NOT



5 bonds to Carbon
YIKES