

COMPLETE THIS SECTION : Up to TWO POINTS will be removed for incorrect/missing information!

PRINTED **FIRST NAME** Answer Key PRINTED **LAST NAME** _____

Person on your **LEFT** (or **Empty** or **Aisle**) _____

Person on your **RIGHT** (or **Empty** or **Aisle**) _____

Class you are REGISTERED FOR (onground or hybrid) _____

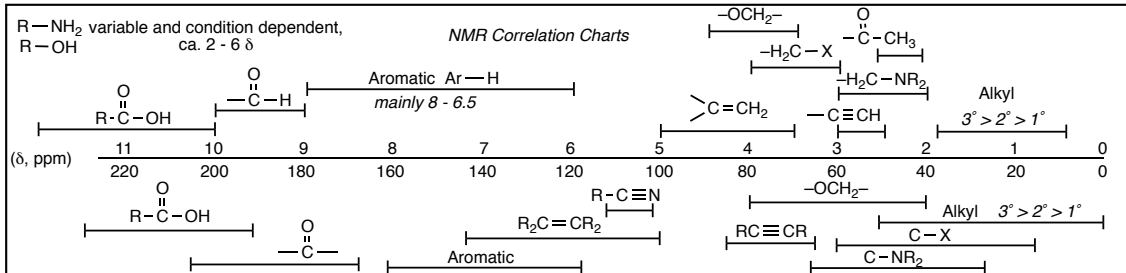
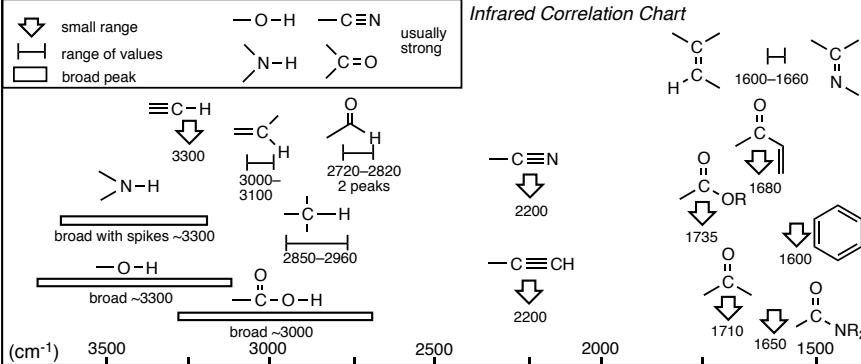
The room where most students will take the test for your class, i.e. LS A-191 for onground and PS H-152 for hybrid) _____

****YOU ARE NOT ALLOWED TO TAKE SPARE COPIES OF THIS EXAM FROM THE TESTING ROOM****

- PRINT YOUR NAME ON EACH PAGE!
- READ THE DIRECTIONS CAREFULLY!
- USE BLANK PAGES AS SCRATCH PAPER
- work on blank pages will not be graded...
- WRITE CLEARLY!
- MOLECULAR MODELS ARE ALLOWED
- DO NOT USE RED INK
- DON'T CHEAT, USE COMMON SENSE!

H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	Lu	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn

Interaction Energies, kcal/mol			
Eclipsing		Gauche	
H/H	-1.0	Me/Me	-0.9
H/Me	-1.4	Et/Me	-0.95
Me/Me	-2.6	i-Pr/Me	-1.1
Et/Et	-3.1	t-Bu/Me	-2.7



**YOU MUST COMPLETE THIS PAGE WITH YOUR NAME
(EVEN THOUGH YOU ALREADY DID THIS ON THE COVER PAGE)
AND ALSO GIVE YOUR ASU OR POSTING ID NUMBER
WE NEED THIS NUMBER BECAUSE YOU WOULDN'T BELIEVE THE NUMBER OF
STUDENTS WHOSE NAMES WE CAN'T READ!**

PRINTED
FIRST NAME _____ *PRINTED*
LAST NAME _____ *ASU ID or*
Posting ID _____

Points by question

1 _____ / 14

2 _____ / 22

3 _____ / 31

4 _____ / 14

5 _____ / 20

6 _____ / 36

7 _____ / 38

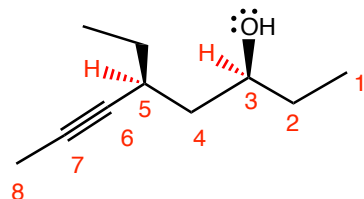
Points Removed for cover errors _____ / 2

Extra Credit _____ / 5

Total (incl Extra) _____ / 175+5

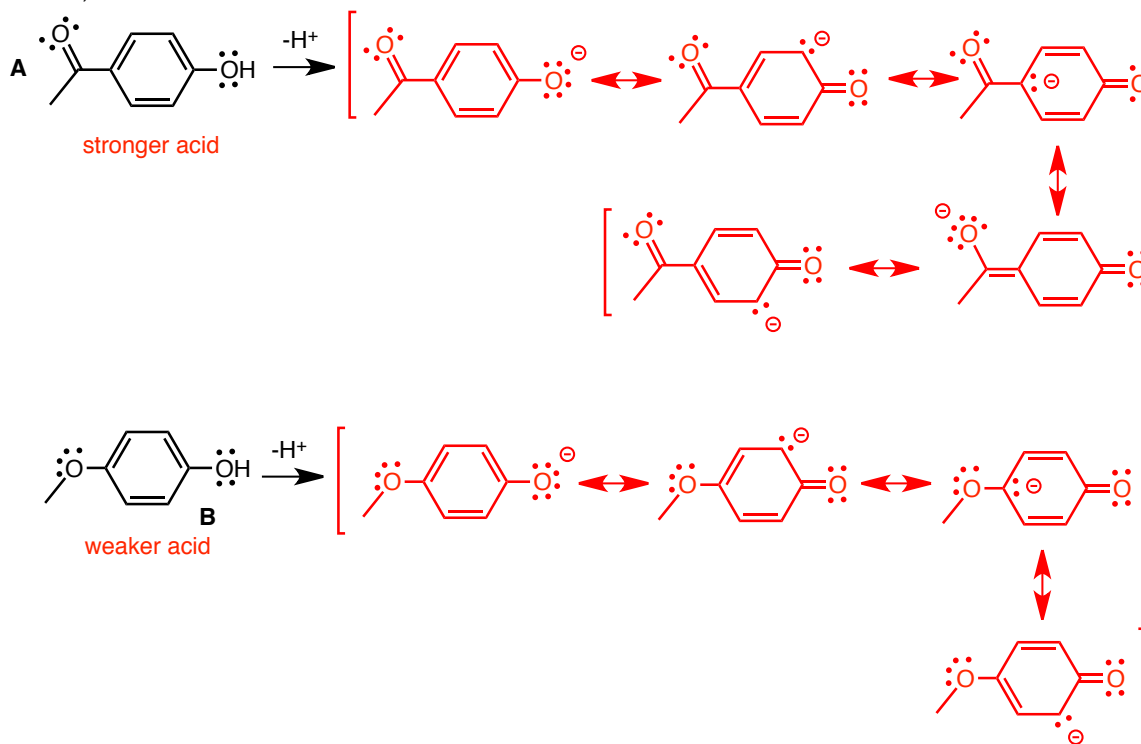
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Question 1 (14 pts.) Give the IUPAC name for the following compound. Be sure to use cis/trans, E/Z or R/S where appropriate.



(5S)-ethylocta-6-yn-(3S)-ol

Question 2 (22 pts.) Which is the stronger Brønsted acid, A or B? Give a BRIEF explanation that includes drawings of **ALL IMPORTANT resonance contributors of the conjugate base anions**. Your explanation **MUST** include the following terms: "electron donating", "electron withdrawing", "resonance" "inductive effect", and also mentions BASE STRENGTH.



the substituent in A is electron withdrawing, it lowers the energy of the electrons in the conjugate base anion, which results in a weaker base that is easier to form, A is the stronger acid

the substituent in B is electron donating, it raises the energy of the electrons in the conjugate base anion, which results in a stronger base that is harder to form, B is the weaker acid

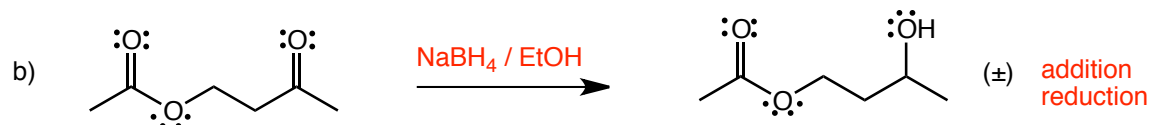
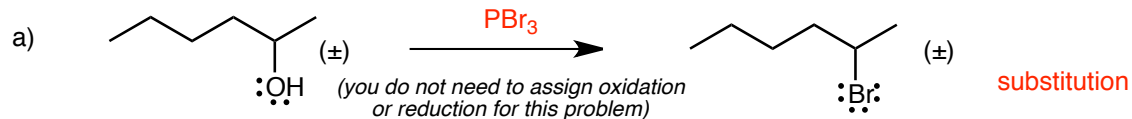
the resonance donation effect of the substituent in B is stronger than the inductive effect, which is why it is overall donating

Question 3 (first part, 15 pts.) For each reaction

1) Provide the missing **reagents/conditions**

2) **State** whether each reaction is an Addition, Elimination, Substitution or Rearrangement

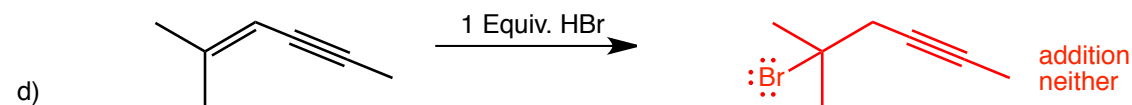
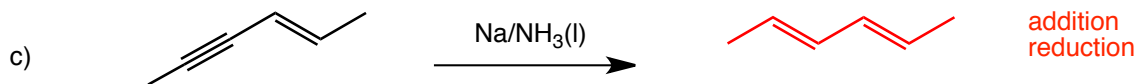
3) **State** whether each reaction is Reduction, Oxidation or Neither



Question 3 (second part, 16 pts.) Give the major organic product of the following reactions

DO NOT STATE whether the reaction is Addition/Elimination/Substitution/Rearrangement

DO NOT STATE whether each reaction is reduction/oxidation/neither



5 pts Extra Credit. Which functional group can be polymerized to form an organic metal?

alcohol

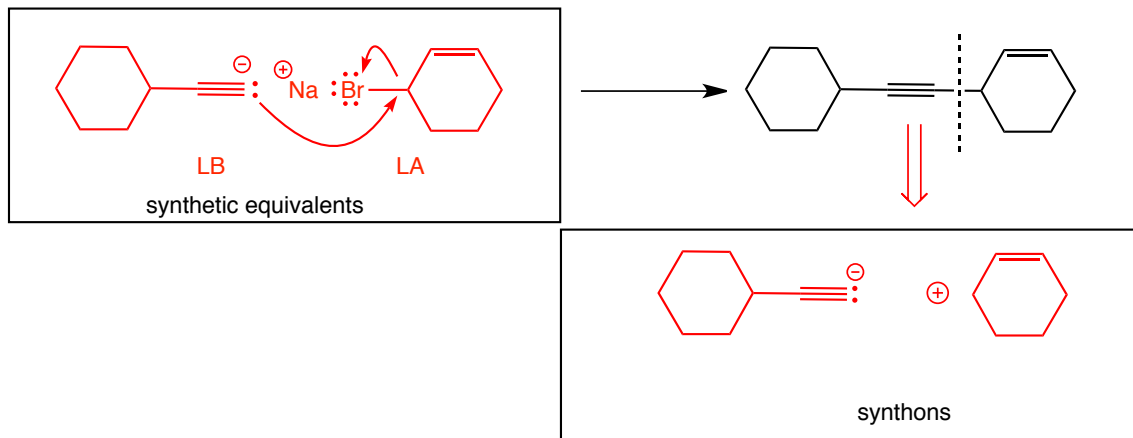
alkene

alkyne

epoxide

from "O-Chem in Real Life" page : organic metals, week #2

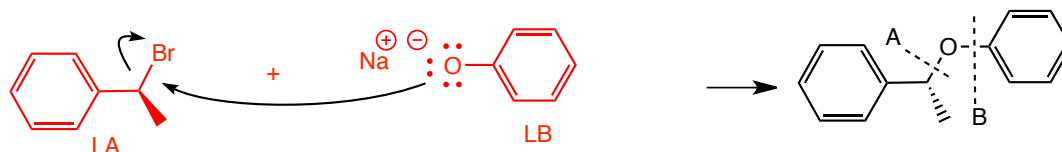
Question 4 (14 pts). Perform retrosynthetic analysis for the bond indicated by the dashed line in the target structure below, generate the best synthons and also the synthetic equivalents. Give the curved arrow pushing for the synthetic equivalents showing bond making/breaking and label them as Lewis acid and Lewis base as appropriate.



Question 5 (20 pts.) For the following structure:

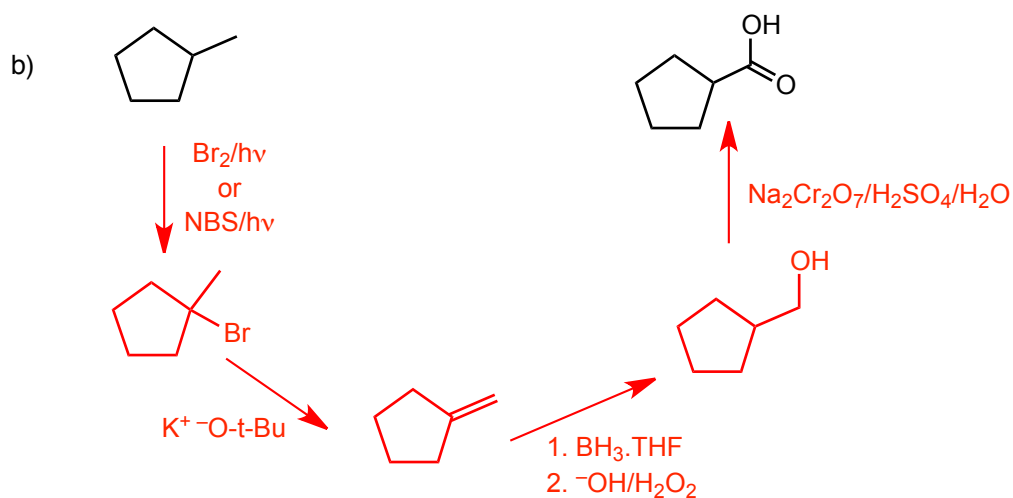
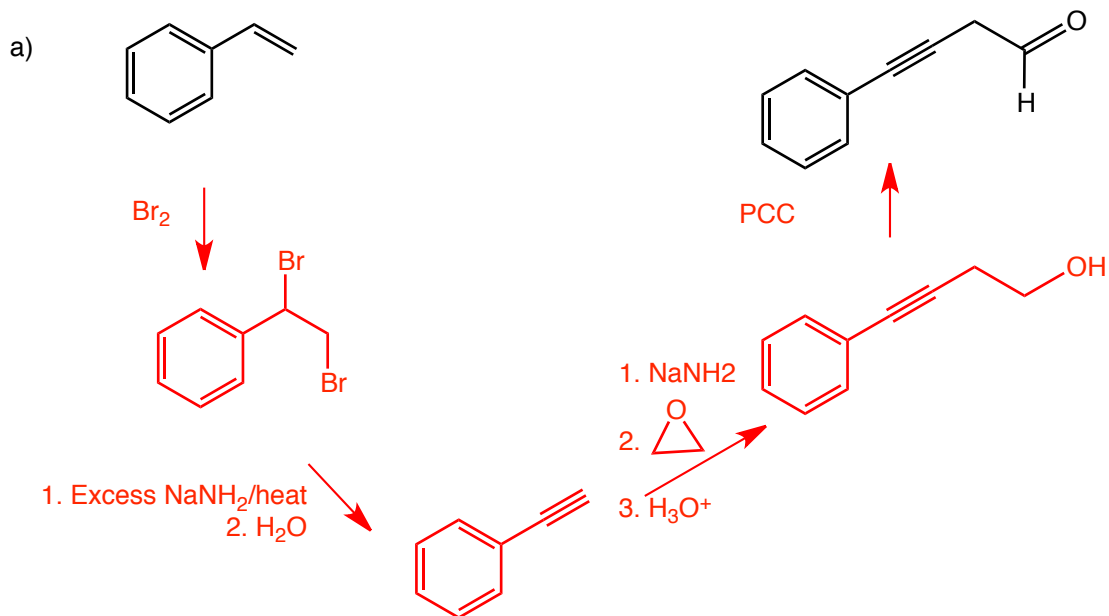
- Decide which of the bonds A and B it is possible to make in an SN2 reaction
- Indicate which bond this is, and give:
 - a complete reagents/conditions (you can choose whichever leaving group you like)
 - the curved arrow pushing showing bond making/breaking
 - assign the Lewis acid and base, as appropriate
- Briefly state why the other bond (A or B) cannot be made.

Bond A can be made as follows:



The problem with making bond B is: **can't do an SN2 at an sp² hybridized carbon**

Question 6 (36 pts.) Show how you would synthesize the target compounds on the right from the starting compounds on the left. Show reagents and conditions, and the structures of important intermediate compounds. Do not show any (arrow pushing) mechanisms.



Question 7 (38 pts). Give a curved arrow pushing mechanisms for the following two reactions.

- 1) Add non-bonding electrons and C-H bonds to the line-angle structures as required.
- 2) Indicate the Lewis acid/Lewis base (LA, LB) at each INTERMOLECULAR step as appropriate, and whether they are also Brønsted acids/bases (LA/BA, LB/BB).
- 3) Include ALL IMPORTANT RESONANCE CONTRIBUTORS for intermediates
- 4) GIVE THE NUMBER OF STEPS IN YOUR MECHANISMS

