CHEM 233, Fall 2007 1st Midterm Exam Ian R. Gould

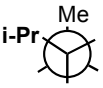
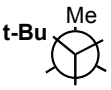
PRINTED **FIRST** NAME _____ *PRINTED* **LAST** NAME _____

ASU ID or Posting ID _____

*Person on your **LEFT** (even if there are empty spaces between you, or print Aisle)* _____

*Person on your **RIGHT** (even if there are empty spaces between you, or print Aisle)* _____

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

ECLIPSING		**kcal/mol**	**GAUCHE**		**kcal/mol**
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
Me / Et		~2.9	t-Bu / Me		~2.7

PRINT YOUR NAME ON EACH PAGE!

READ THE DIRECTIONS FOR EACH PROBLEM CAREFULLY!

Be sure your exam has **8** numbered questions on **6** total pages

Use any blank pages as scratch paper. They will not be graded.

Write CLEARLY. Illegible answers will be considered to be incorrect.

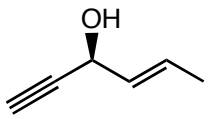
Molecular models are allowed.

Do not use red ink.

DON'T CHEAT, USE COMMON SENSE!

1	/ 14
2	/ 20
3	/ 26
4	/ 30
5	/ 8
6	/ 35
7	/ 20
8	/ 22
Extra	/ 5
Total	/ 175 + 5

Question 1 (10 pts.) Give an unambiguous IUPAC or common name for the following compound. Be sure to use cis/trans, E/Z or R/S where appropriate.



Question 2 (10 pts.). Sodium borohydride ($NaBH_4$) reduces only aldehydes and ketones. Lithium aluminum hydride ($LiAlH_4$) will reduce aldehydes and ketones and also esters and carboxylic acids. Do you think that sodium hydride (NaH) will also reduce esters and acids? Give a BRIEF explanation for your asnwer.

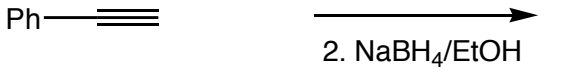
5 pts Extra Credit. organic metals can be made by polymerizing.....

epoxides alkenes alcohols alkynes

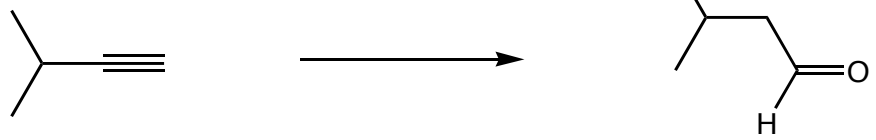
Question 3 (35 pts.)

Provide the missing **major organic product, the reagents and conditions, or the reactant** for the following reactions, as appropriate. Ignore stereochemistry.

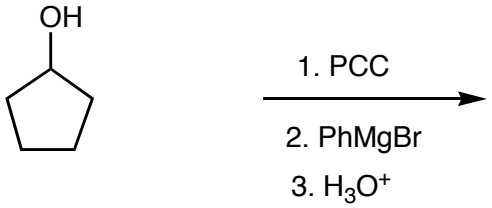
a)



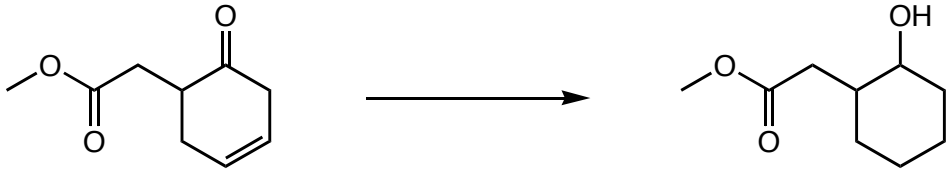
b)



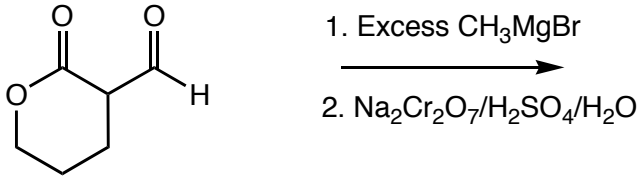
c)



d)

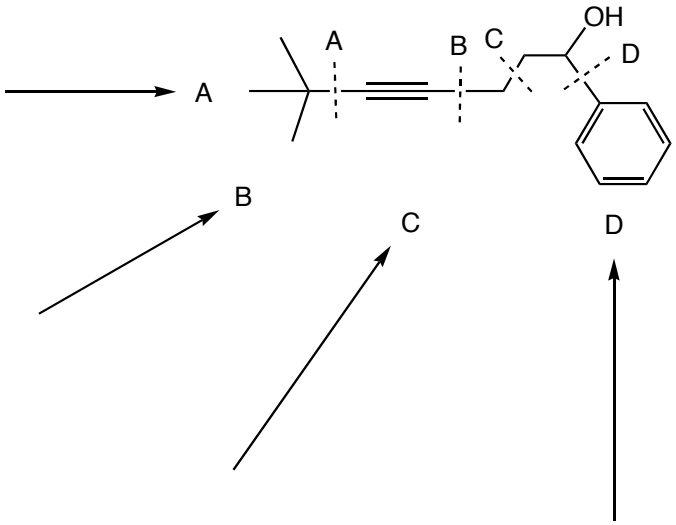


e)



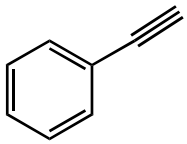
Question 4 (24 pts.) For **EACH of the bonds labelled A, B, C and D**, draw the **structure of the the acetylide anion OR the Grignard reagent** AND the **other structure it would react with** to make the bond and give the product shown (you do not need to specify any follow-up hydrolysis steps using H_3O^+, they are assumed)

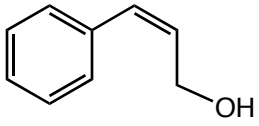
IF IT IS NOT POSSIBLE TO MAKE THE BOND using an actetylide or Grignard reaction, give a **BRIEF explantion why not.**



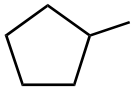
Question 5 (38 pts.) Show how you would synthesize the target componds on the right from the starting compounds on the left. Show reagents and conditions, and the structures of important intermediate compounds. Do not show any (arrow pushing) mechanisms.

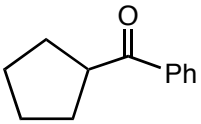
a)





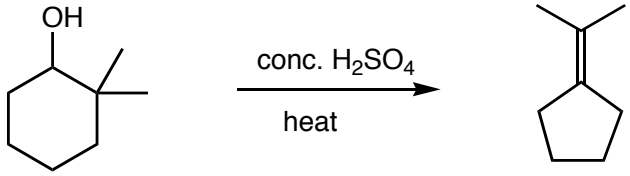
b)



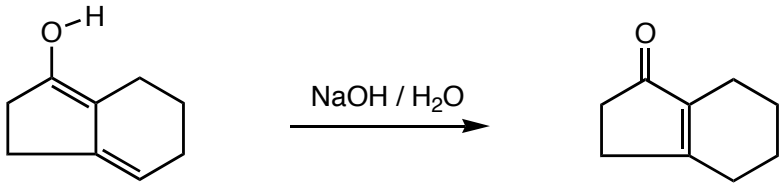


Question 6 (34 pts). **READ THIS QUESTION CAREFULLY**!! For **EACH** reaction, give a complete arrow pushing mechanism, and...
1) Show **ALL** important resonance structures of any intermediates.
2) Add non-bonding electrons and C-H bonds to the line-angle structures as required.
3) Indicate the Lewis acid/Lewis base (LA, LB) at each step as appropriate, and whether they are also Brønsted acids/bases (LA/BA, LB,BB).

a)



b)



Question 7 (12 pts). For the following acid/base equilibrium

i) Indicate the stronger and weaker **ACID**
ii) Indicate the stronger and weaker **BASE**
ii) indicate which acid has the **LARGER** and which the **SMALLER pKa**
iii) Indicate clearly which side the equilibrium will lie
iii) Give a BRIEF explanation for your choices for ALL of the above

Question 8 (12 pts). Which of the two following alcohols is the stronger Brønsted acid? Give a BRIEF explanation, using drawings of resonance contributors if helpful.