

PRINTED FIRST NAME _____

PRINTED LAST NAME _____

ASU ID or Posting ID _____

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

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

- **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!**

1 _____ /10

2 _____ /18.....

3 _____ /32.....

4 _____ /40.....

5 _____ /20

6 _____ /20.....

7 _____ /15.....

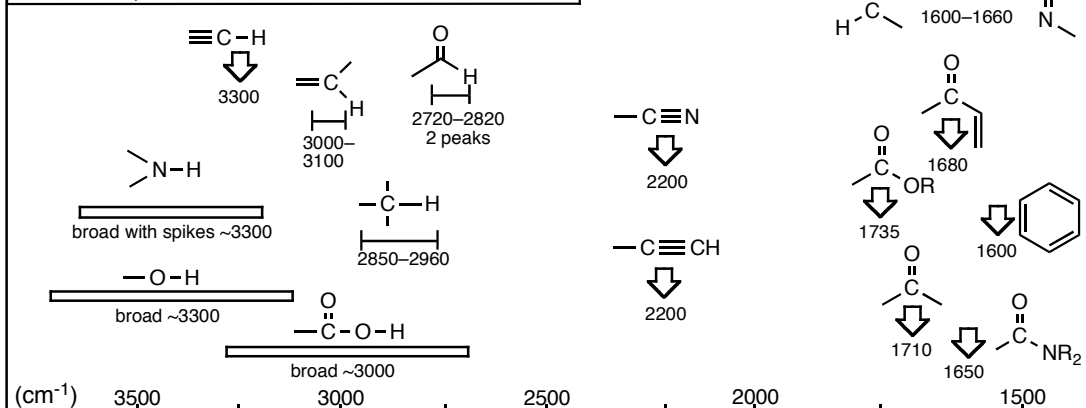
Extra Credit _____ /5

Total (incl Extra) _____ /175+5

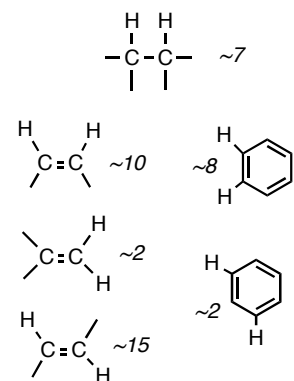
H							He	Interaction Energies, kcal/mol <table border="1"> <thead> <tr> <th></th> <th>Eclipsing</th> <th>Gauche</th> </tr> </thead> <tbody> <tr> <td>H/H</td> <td>~1.0</td> <td>Me/Me ~0.9</td> </tr> <tr> <td>H/Me</td> <td>~1.4</td> <td>Et/Me ~0.95</td> </tr> <tr> <td>Me/Me</td> <td>~2.6</td> <td>i-Pr/Me ~1.1</td> </tr> <tr> <td>Me/Et</td> <td>~2.9</td> <td>t-Bu/Me ~2.7</td> </tr> </tbody> </table>		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	Me/Et	~2.9	t-Bu/Me ~2.7
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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																					

usually strong

Infrared Correlation Chart

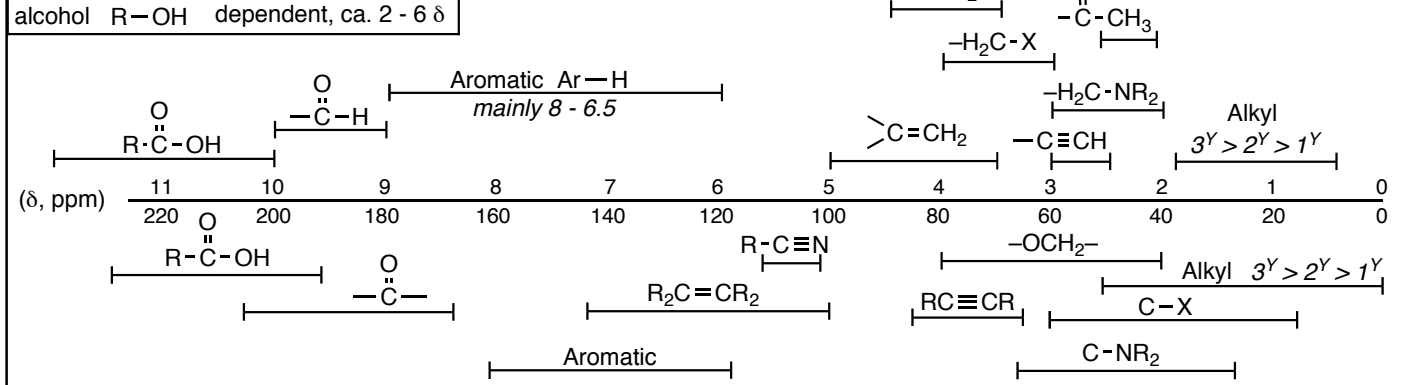


Approximate Coupling Constants, J (Hz), for ¹H NMR Spectra

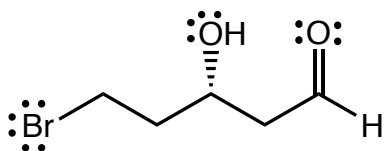


amine R-NH₂ variable and condition dependent, ca. 2 - 6 δ
 alcohol R-OH

NMR Correlation Charts



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



Question 2 (18 pts)

a) Give the structures of the best carbonyl compound and the best phosphonium ylide to prepare the provided alkene in a Wittig synthesis (do not give the mechanism).



b) Show how your phosphonium ylide would be synthesized from an alkyl bromide. Do not show mechanisms, but give the reagents and conditions for each step of the synthesis.

Extra credit question (5 pts). β -carotene is synthesized using which reaction?

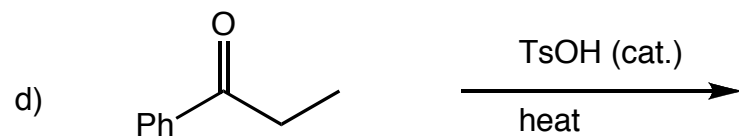
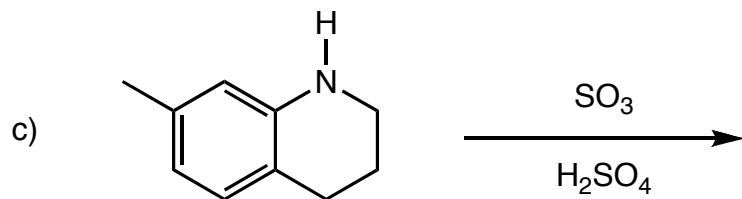
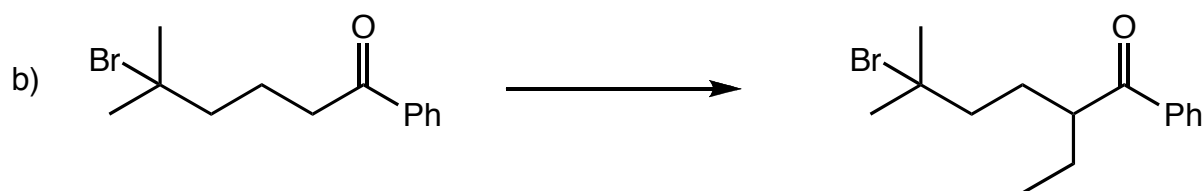
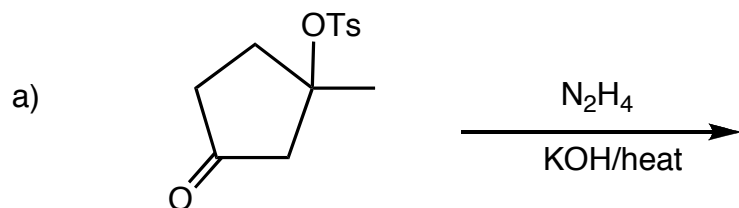
Clemmenson

Grignard

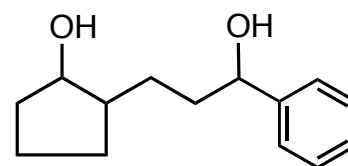
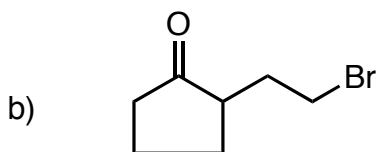
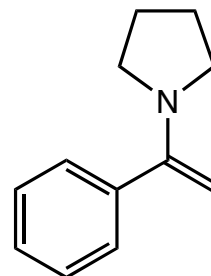
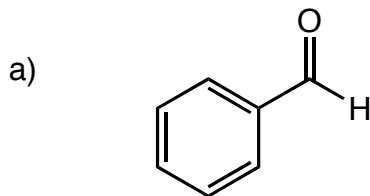
Wittig

Aldol

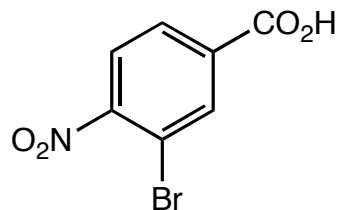
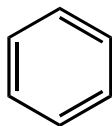
Question 3 (32 pts.) Provide the missing reaction products or reagents/conditions as required



Question 4 (40 pts.) In each case, synthesize the (target) molecules on the right from the starting molecules the left. this can not be done in one reaction. Give reagents and conditions and the intermediate molecules at each step. Do not show any mechanisms or transient intermediates.



Question 5 (20 pts.) Synthesize the (target) molecule on the right from the starting molecule the left. this can not be done in one reaction. Give reagents and conditions and the intermediate molecules at each step. Do not show any mechanisms or transient intermediates.

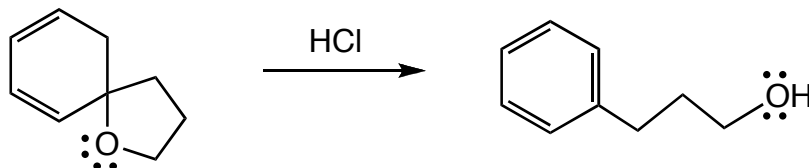


Question 6 (20 pts.) Give a complete arrow-pushing mechanisms for the following reactions

Show exactly where each proton comes from and goes to (no $+H^+$ or $-H^+$).

Indicate the lewis acid/base for each INTERmolecular step (LB or LA) and whether they are also Brønsted bases/acids (LB/BB or LA/BA)

DO NOT ATTEMPT TO DRAW ALL RESONANCE CONTRIBUTORS OF THE INTERMEDIATES, DRAW ONLY THE RELEVANT ONES



Question 7 (35 pts.) Give a complete arrow-pushing mechanisms for the following reactions

Show exactly where each proton comes from and goes to (no $+H^+$ or $-H^+$).

Indicate the lewis acid/base for each INTERmolecular step (LB or LA) and whether they are also Brønsted bases/acids (LB/BB or LA/BA)

DRAW ALL RESONANCE CONTRIBUTORS OF THE INTERMEDIATES!!

