Person on your LEFT (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!

Person on your RIGHT (or Aisle)

1. nomen /12
2. acids /18
3. rxns /36
4. E2 /24
5. synthons /14
6. retro /36
7. mxns /36

Extra Credit /5
Total (incl Extra) /175+5

Interaction Energies, kcal/mol

<table>
<thead>
<tr>
<th>Eclipsing</th>
<th>Gauche</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\text{H}/\text{H}$</td>
<td>$\text{He}/\text{He}$</td>
</tr>
<tr>
<td>$\text{H}/\text{Me}$</td>
<td>$\text{He}/\text{Me}$</td>
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<tr>
<td>$\text{Me}/\text{Me}$</td>
<td>$\text{Me}/\text{Me}$</td>
</tr>
<tr>
<td>$\text{Et}/\text{Me}$</td>
<td>$\text{i-Pr}/\text{Me}$</td>
</tr>
<tr>
<td>$\text{t-Bu}/\text{Me}$</td>
<td>$\text{Me}/\text{Et}$</td>
</tr>
</tbody>
</table>

Infrared Correlation Chart

Approximate Coupling Constants, J (Hz), for $^1\text{H}$ NMR Spectra

**CHEM 234, Spring 2015**

**PRINTED**

**ANSWER**

**PRINTED**

**FIRST NAME**

**LAST NAME**

**KEY**

**ASU ID or Posting ID**
Question 1 (12 pts.) Give the IUPAC name for the following compound. Be sure to use cis/trans, E/Z or R/S where appropriate.

3-methylhept-(3Z)-en-6-yn-(2S)-ol

Question 2 (18 pts). Which is the stronger Bronsted acid, A or B (ignore keto-tautomers). Give a BRIEF explanation and support your assignment using appropriate drawings of the conjugate base anions

When deprotonated, the conjugate base alkoxide anion from A has fewer resonance contributors, the non-bonding electrons not as delocalized, they are higher in energy, the anion is less stable, this A is the weaker Bronsted acid.

The conjugate base alkoxide from B has more resonance contributors, the non-bonding electrons are more delocalized/stabilized, B is thus a stronger Bronsted acid.
Question 3 (36 pts.) For each reaction on this page, provide the missing major organic product or reagents/conditions as appropriate, and state whether the reactions are Addition, Elimination, Substitution or Rearrangement and whether they are Reduction, Oxidation or Neither unless otherwise requested.

a) \[
\begin{align*}
&\text{HO} \quad \text{Excess PCC/CH}_2\text{Cl}_2 \\
&\text{elimination and oxidation}
\end{align*}
\]

b) \[
\begin{align*}
&\text{K}^+\text{OMe} \\
&\text{elimination and neither}
\end{align*}
\]

c) \[
\begin{align*}
&1. \text{HBr/ROOR} \\
&2. \text{Na}^+\text{OH} \\
&3. \text{Na}_2\text{Cr}_2\text{O}_7/\text{H}_2\text{SO}_4/\text{H}_2\text{O} \\
&(\text{ignore addition/elimination etc and also oxidation/reduction})
\end{align*}
\]

d) \[
\begin{align*}
&1. \text{Excess NaNH}_2/\text{heat} \\
&2. \text{H}_2\text{O} \\
&3. \text{1 Equiv. HBr} \\
&(\text{ignore addition/elimination etc and also oxidation/reduction})
\end{align*}
\]

5 pts Extra Credit. Organic metals can be made by polymerizing..... epoxides, alkenes, alcohols, alkynes from "O-Chem in Real Life" page: Organic Metals.
Question 4 (24 pts.) For (2R)-bromo-(3R)-methylpentane, draw a Lewis structure with wedged/dashed bonds with proper stereochemistry, draw a 3D/sawhorse structure AND a Newman projection of the conformation that would undergo E2 elimination, AND give the alkene that would be formed in an E2 elimination reaction.

OR...

Lewis structure
Newman projection
alkene product

Question 5 (14 pts.) For synthesis of the structure below
1) decide which would be the best bond to make in an SN2 reaction
2) perform retrosynthetic analysis on the bond you want to make and give the synthons
3) give the synthetic equivalents to perform the SN2 reaction, assign each one as a Lewis acid or Lewis base, and give the curved arrow pushing showing bond formation

Lewis base
synthetic equivalents
Lewis acid
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.

a) 

\[
\begin{align*}
\text{NaNH}_2 & \quad \xrightarrow{\text{heat}} \quad \text{Na, NH}_3(\text{l}) \\
\text{O} & \quad \xrightarrow{\text{H}_2\text{O}} \\
\text{OH} & \\
\end{align*}
\]

b) 

\[
\begin{align*}
\text{A} & \quad \xrightarrow{\text{Br}_2} \quad \text{B} \\
\text{Br} & \quad \xrightarrow{\text{H}_2\text{O}} \\
\text{OH} & \\
\end{align*}
\]

1. Excess NaNH$_2$ / heat
2. H$_2$O
Question 7 (35 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) GIVE THE NUMBER OF STEPS IN YOUR MECHANISM.

a) 

\[ \text{HO:} \cdot \text{OH} \xrightarrow{\text{H}_2\text{SO}_4 \text{cat.}} \text{H}_2\text{O} \]

\[ \text{LA/BA} \]

\[ \text{LB/BB} \]

3 steps

b) 

\[ \text{LB/BB} \xrightarrow{\text{conc. H}_2\text{SO}_4, \text{heat}} \]

\[ \text{LA/BA} \]

\[ \text{LB/BB} \]

5 steps