Homework Set #4
Chemistry 1315
Spring 2004

_________________________
Name

Handed out 2/12/04
Due: 2/19/04

Late Policy: One day late (2-20-04 10am): 50% off
Two days late (2-21-04 10 am): 75% off
After 10 am 2-22-04: no credit

You may work in groups of up to 3 students. However each must make contributions to
the answers. For this homework set draw CLEAR three dimensional structures. If the
TA or I cannot read your structures, you will receive NO credit even if- after a long
explanation on your part the structure seems to be right.

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<th>Questions</th>
<th>Possible points</th>
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1) (20 points) Name the following molecules. Assign as R or S if appropriate. Draw A-E as Fisher projections.
2) (10 points) How many stereoisomer does 2-amino-3-hydroxy butanoic acid have?  
b) draw all stereoisomer showing all stereocenters  
c) Label each stereocenter (R or S)
3) (15 points)

a) Is the trans 1-2 dimethylcyclopentane superimposable on its mirror image?

b) Is the cis 1-2 dimethylcyclopentane superimposable on its mirror image?

c) Is 3 chiral? Optically active?

d) What is the stereoisomeric relationship between 1 and 3?

e) Between 2 and 3?

f) Which is the meso compound?
4) (15 points) Label all stereocenters and assign R and S configurations to the following Fisher Projections.

a) 
\[
\text{NH}_2
\quad
\text{H} \quad \text{CO}_2\text{OH}
\quad
\text{H} \quad \text{OH}
\quad
\text{H} \quad \text{H}
\quad
\begin{array}{c}
\text{H} \\
\text{H}
\end{array}
\]

b) 
\[
\quad \text{H} \quad \text{CH}_2\text{CH}_3
\quad \text{CO}_2\text{H}
\quad \text{H} \quad \text{OH}
\quad \text{H} \quad \text{OH}
\quad \text{CH}_2\text{OH}
\]

c) 
\[
\quad \text{CO}_2\text{OH}
\quad \text{H} \quad \text{OH}
\quad \text{H} \quad \text{OH}
\quad \text{CH}_2\text{OH}
\]

d) 
\[
\quad \text{H} \quad \text{COOH}
\quad \text{H} \quad \text{CN}
\quad \text{Br}
\]

e) 
\[
\quad \text{H} \quad \text{Br}
\quad \text{CN}
\quad \text{CN}
\]

f) 
\[
\quad \text{H} \quad \text{COOH}
\quad \text{H} \quad \text{CN}
\quad \text{CN}
\quad \text{CH}_3
\]

g) 
\[
\quad \text{H} \quad \text{Br}
\quad \text{CN}
\quad \text{CN}
\quad \text{CH}_3
\]
5) (10 points)

a) Convert the above structure to the two lowest energy chair conformations.
b) For each chair drawn, now draw the corresponding Newman projections, which chair corresponds to which Newman?
c) Which of your drawings has the lowest energy?
6. (10 points) Rank the following in increasing reactivity towards
a) an SN2 Reaction

\[ \begin{align*}
\text{B} & < \text{C} < \text{A} \\
\text{B} & < \text{C} < \text{A}
\end{align*} \]

b) an SN1 Reaction

\[ \begin{align*}
\text{B} & < \text{C} < \text{A} \\
\text{B} & < \text{C} < \text{A}
\end{align*} \]
7) (10 points) How would you make allyl phenyl ether by an SN2 reaction? Show structures for all materials and draw a mechanism (including transition state).
8) (10 points) Predict the products of the following reactions

a)

\[
\text{CH}_3\text{CH}_2\text{I} + \text{KCN} \rightarrow S_{N2} \rightarrow \\
\]

b)

\[
\text{CH}_3\text{CH}_2\text{Br} + \text{CH}_3\text{CH}_2\text{OH} \rightarrow S_{N1} \rightarrow \\
\]

c)

\[
\text{Cl}_2\text{CBrCl}_3 + \text{KOH} \rightarrow S_{N2} \rightarrow \\
\]

d)

\[
\text{C}_6\text{H}_5\text{CN} + \text{CH}_3\text{I} \rightarrow S_{N2} \rightarrow \\
\]