1. (8 pts) Name the following compounds.
   a) ______________________________
   b) ______________________________
   c) ______________________________
   d) ______________________________

2. (8 pts) Draw the following compounds corresponding to the following names.
   a) 2-ethyl-3-dimethylheptane
   b) cis-1-isobutyl-2-methylcyclobutane
   c) bicyclo[2.2.2]octane
   d) 1-ethyl-2-(2,2-dimethylbutyl)cyclopentane

3. (8 pts) Explain the order of acidity for the following compounds.
   \[
   \begin{array}{cccc}
   \text{CH}_3\text{CH}_2\text{SH} & \text{CH}_3\text{CH}_2\text{OH} & \text{CH}_3\text{CH}_2\text{NH}_2 & \text{pKa} \\
   10.5 & 15.9 & \text{approx. 37} \\
   \end{array}
   \]
4. (9 pts) Predict the order of basicity for the following Lewis bases. (put a 1 by the strongest base and a 3 by the least basic) Explain your reasoning.

5. (9 pts) a) Use a Newman projection to draw the gauche conformation for the ethyl substituents on the following compound. Draw the projection from carbon 1 to carbon 2.

b) Draw the stick figure diagram from the following Newman projection.

c) Draw the Newman projection for butane with a dihedral angle of 120°.

6. (12 pts) For the following compounds below, draw the important resonance forms and indicate which structures are major and minor contributors. Write the formal charge next to any atom that is not zero.

a)

b)
7. (10 pts) Rank the protons 1 through 5 according to their acidity. (most acidic to least acidic)

8. (8 pts) Predict whether the methyls or tertbutyl substituents in the following molecules are axial or equatorial. (Place ax or eq in the blanks)

9. (10 pts) Fill in the missing product or products for the following reaction.

\[ \text{Cl}_2 + \text{CH}_4 \xrightarrow{\text{light or heat}} \]
10. (12 pts) Fill in the information for the numbered atoms in the following molecule.

\[
\begin{array}{c}
\text{H} \quad \text{N} \quad \text{S} \\
\text{H} \quad 1 \quad 2 \quad 3 \quad 4
\end{array}
\]

*electron pair geometry molecular geometry hybridization*

a. Nitrogen 1

b. Carbon 2

c. Sulfur 3

d. Carbon 4

11.(14 pts) For each x predict the molecules that would be present in that solvent. Start with the two phases of ether and NaOH.

\[
\begin{array}{c}
\text{O} \\
\text{C} \\
\text{O} \\
\text{OCH}_2\text{CH}_3
\end{array}
\]

1 \quad 2 \quad 3 \quad 4 \quad 5

<table>
<thead>
<tr>
<th>Ether</th>
<th>Add aqueos NaOH</th>
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<table>
<thead>
<tr>
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<th>aqueos HCl</th>
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<td>X</td>
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