1. (8 pts) Name the following compounds.

a) ______________________________  b) ___________________________

![Chemical structure](image1)

![Chemical structure](image2)

c) ______________________________  d) ___________________________

![Chemical structure](image3)

![Chemical structure](image4)

2. (8 pts) Draw the following compounds corresponding to the following names.

a) 2,2-dimethylheptane  b) cis-1-tertbutyl-2-methylcyclobutane

c) bicyclo[2.2.1]heptane  d) 1-ethyl-2-(2,2-dimethylbutyl)cyclopentane
3. (8 pts) Circle the compounds that are more acidic in the following pairs. **Explain.**

   a) \( \text{H}_2\text{CF-vector} \text{COH} \)  
   b) \( \text{H}_2\text{CB}-\text{COH} \)

4. (8 pts) a) Draw the anti conformation for the ethyl substituents on the following compound using a Newman projection. Draw the projection from carbon 1 to carbon 2.

   ![Newman projection](image)

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

   ![Stick figure](image)

5. (6 pts) Circle the compound(s) below that would most likely be soluble in \( \text{CCl}_4 \) and put a box around the compound(s) that would most likely be soluble in water.

   \( \text{CH}_3\text{OH} \quad \text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3 \quad \text{NH}_3 \quad \text{BF}_3 \quad \text{H}_2\text{S} \quad \text{KCl} \)
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)
\[
\text{N}=\text{C} \cdots \text{C} \cdots \text{C} \cdots \text{OH}
\]

b)
\[
\text{H}_2\text{C} \equiv \text{C} \equiv \text{C} \equiv \text{NH}_2
\]

7. (9 pts) Place the following molecules in order of basicity. Put a 1 by the most basic and a 3 by the least basic.

\[
\text{CH}_3\text{O}^- \quad \text{NH}_2^- \quad \text{CH}_3\text{COO}^-
\]

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

a)
\[
3\text{- methyl} \quad \text{4- methyl}
\]

b)
\[
1\text{- tertbutyl} \quad 1\text{- tertbutyl}
\]
9. (12 pts) Fill in the information for the numbered atoms in the following molecule.

\[
\begin{array}{c}
\text{N} \\
\text{C} \\
\text{N} \\
\text{H} \\
\text{O} \\
\text{B} \\
\text{H} \\
\text{H}
\end{array}
\]

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a. Carbon 1

b. Carbon 2

c. Nitrogen 3

d. Boron 4

10. (8 pts) Fill in the missing product or products for the following reaction.

\[ \text{Cl}_2 + \text{CH}_4 \xrightarrow{\text{light or heat}} \]

11. (6 pts) Put the following molecules in order of decreasing boiling point. (1 highest, 3 lowest)

2,3-dimethylbutane, 2-methylpentane, n-hexane

12. (12 pts) How do the basicities of the following molecules compare with ethyl amine (stronger or weaker)? For each case state your reasoning.

Ethyl amine

\[
\begin{array}{c}
\text{CH}_3\text{CH}_2\text{NH}_2 \\
\text{H}_3\text{C} = \text{NH}_2 \\
\text{(H}_3\text{C})_2\text{B} = \text{NH}_2 \\
\text{CF}_3\text{NH}_2
\end{array}
\]