“In the time of chimpanzees, I was a monkey
Butane in my veins and I’m out to cut the junkie”

-Beck, *Loser*
1. a. Circle and identify the functional groups in the following molecule. (Don’t be confused by the arrows…they are pointed at specific atoms for part b.) (14 pts)

   ![Functional Groups Diagram](image)

   alcohol, aromatic, amine, alkene, ether, amide, nitrile

b. Identify the hybridization and shape of five of the indicated atoms a -f. (The indicated atoms have arrows pointed at them.) (10 pts)

   a sp3 tetrahedral
   b sp2 trigonal planar
   c sp3 tetrahedral
   d sp2 trigonal planar
   e sp linear
   f sp2 trigonal planar
   g sp3 tetrahedral
(16 pts) 2. Draw one **GOOD** Lewis structure AND one **GOOD** resonance form for each of the following molecules. (8 pts each)

a. \((\text{CH}_3)_2\text{CCN}^-\)

\[
\begin{align*}
\text{CH}_3 & \quad \text{C} \quad \text{==N} \quad \text{CH}_3 \\
\text{CH}_3 & \quad \text{C} \quad \text{==N} \quad \text{CH}_3
\end{align*}
\]

b. \(\text{CH}_3\text{CHC(CH}_3\text{)CHCH}_2\text{CH}_3^-\)

\[
\begin{align*}
\text{CH}_3 & \quad \text{CH} \quad \text{CH} \quad \text{CH} \quad \text{CH} \quad \text{CH} \quad \text{CH}_3 \\
\text{CH}_3 & \quad \text{CH} \quad \text{CH} \quad \text{CH} \quad \text{CH} \quad \text{CH} \quad \text{CH}_3
\end{align*}
\]

(12 pts) 3. Name or draw the following compounds:

a. 2-bromo-3,5-dimethyl-4-n-propylheptane

\[
\begin{align*}
\text{Br} & \quad \text{CH} \quad \text{CH} \quad \text{CH} \quad \text{CH} \quad \text{CH} \quad \text{CH} \\
\text{CH} & \quad \text{CH} \quad \text{CH} \quad \text{CH} \quad \text{CH} \quad \text{CH}_3
\end{align*}
\]

b. 3-cyclopropyl-4-isobutylcetane (draw)

\[
\begin{align*}
\text{CH}_3 & \quad \text{CH} \quad \text{CH} \quad \text{CH} \quad \text{CH} \quad \text{CH} \\
\text{CH} & \quad \text{CH} \quad \text{CH} \quad \text{CH} \quad \text{CH} \quad \text{CH}_3
\end{align*}
\]

c. 3-isopropyl-2,2,5-trimethylheptane

\[
\begin{align*}
\text{CH}_3 & \quad \text{CH} \quad \text{CH} \quad \text{CH} \quad \text{CH} \quad \text{CH} \\
\text{CH} & \quad \text{CH} \quad \text{CH} \quad \text{CH} \quad \text{CH} \quad \text{CH}_3
\end{align*}
\]

d. 5-cyclobutyl-2-heptyne (or 5-cyclobutylhept-2-yne)
(12 pts) 4. Name the following compound. Draw a constitutional/structural isomer of it and name the isomer.

3,8-diethyl-7-isopropyl-2,2,4-trimethyldecane

Any reasonable drawing of C\textsubscript{20}H\textsubscript{42} was given full credit. Any correct name was given full credit. Drawing the same thing and naming it differently than above lost eight points.

(24 pts) 5. Identify the relationship between 6 of the 7 of the following pairs of compounds. You may choose from same thing, different compound, resonance forms, constitutional/structural isomers and geometric isomers.

a. \textit{and} 2-chloro-3-ethyl-5-methylhexane \textbf{SAME}

b. \textit{and} \textbf{STRUCT/CONST}

c. \textit{and} \textbf{DIFFERENT}
d. 2, 4-dimethylheptane

e. cis-1-chloro-1-propene

f. iPr and Me

g. iPr and Me

(12 pts) 6. Draw all the staggered Newman projections of 3,4-dimethyl-1-heptene from the perspective of the C3-C4 bond.

(3 pts) Extra Credit.

Name one of the named hurricanes or tropical storms from the 2004 (like, right now) season.

Any correct answer taken (check www.noaa.gov for a complete list).