1. Convert the condensed formula into the skeletal structure and the Lewis structure.

\[
\text{CH}_3\text{CH}_2\text{(C=O)CF}_2\text{CH=CHOCH}_2\text{CH(OCH}_3\text{)}_2
\]

\text{or}

\[
\text{CH}_3\text{CH}_2\text{COCF}_2\text{CH=CHOCH}_2\text{CH(OCH}_3\text{)}_2
\]

2. For the structure below, draw two additional resonance structures and identify the major, minor, and very minor. Also, draw the hybrid structure. Be sure to assign formal/partial charges, if needed.
3. Rank the bonds indicated as a, b, and c in increasing length and strength. Afterwards, identify the number of $\sigma$ and $\pi$ C-C bonds for each structure.

\[
\begin{array}{ccc}
\text{a} & \text{b} & \text{c} \\
\text{\(\sigma\): 7 bond(s)} & \text{\(\sigma\): 7 bond(s)} & \text{\(\sigma\): 7 bond(s)} \\
\text{\(\pi\): 0 bond(s)} & \text{\(\pi\): 1 bond(s)} & \text{\(\pi\): 2 bond(s)} \\
\end{array}
\]

Strength: \( a < b < c \)

Length: \( c < b < a \)

4. Identify the molecular geometry and the bond angle around the atoms indicated as a, b, and c.

a: linear, 180°

b: trigonal planar, 120°

c: trigonal pyramid, <109°

5. With the reference compound, A, label the given structures as a constitutional isomer, resonance, or neither. Hint: draw the hydrogens.

A

neither  constitutional isomer  resonance  constitutional isomer
6. Rank the following compounds in increasing acidity.

a. 

\[
\begin{align*}
\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{H} < \text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH} < \text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{NH}_2
\end{align*}
\]

b. 

\[
\begin{align*}
\text{F}\text{CH}_3\text{CH}_2\text{SH} < \text{F}\text{CH}_3\text{CH}_2\text{SH} < \text{F}\text{CH}_3\text{CH}_2\text{SH}
\end{align*}
\]

c. 

\[
\begin{align*}
\text{NH}_2\text{CH}_3\text{CH}_2\text{CONH}_2 < \text{NH}_2\text{CH}_3\text{CH}_2\text{CONH}_2 < \text{Cl}\text{CH}_3\text{CH}_2\text{CONH}_2
\end{align*}
\]

7. Draw the products of the acid-base reaction and show the movement of electrons using curved arrows. Predict the direction of the equilibrium and the ratio of reactants to products. Label the acid, base, conjugate acid, and the conjugate base.

- Element and electronegativity (what element is the potential acid H attached to)
- Inductive effect (electron-withdrawing elements nearby, but NOT directly attached to the acidic H)
- Resonance stabilization (is the conjugate base stabilized by resonance)
- Hybridization (if all other things are equal, what is the hybridization of the atom directly attached to the acidic H)
8. Lisinopril is a common prescription for patients with high blood pressure. Circle and identify all functional groups in Lisinopril.

![Chemical structure of Lisinopril]

a. For the bonds indicated as a, b, and c, list the bond type and the orbitals that overlap.

**a:** sigma bond, 2sp2 and 2sp3/or/ Csp2 and Csp3

**b:** pi bond, 2p and 2p; sigma bond 2sp2 and 2sp2/or/ Csp2 and Csp2

**c:** sigma bond, 2sp3 and 2sp3/or/Csp3 and Csp3