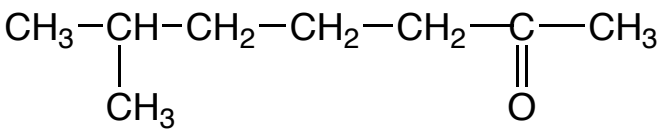
NAME (Print): _____

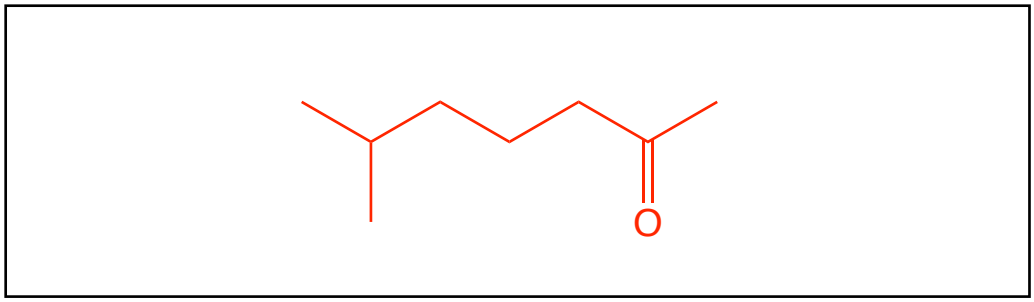
SIGNATURE: _____

Chemistry 320M/328M
Dr. Brent Iverson
2nd Homework
September 1, 2022

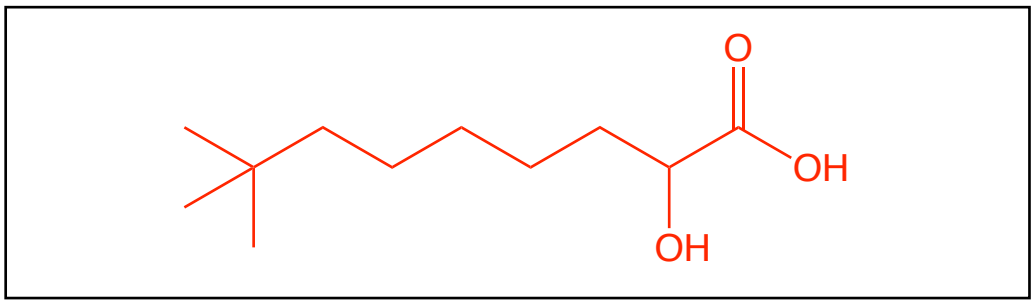
Please print the first three letters of your last name in the three boxes

1) (5 pts each) Draw the appropriate line-angle structures for the following molecules.

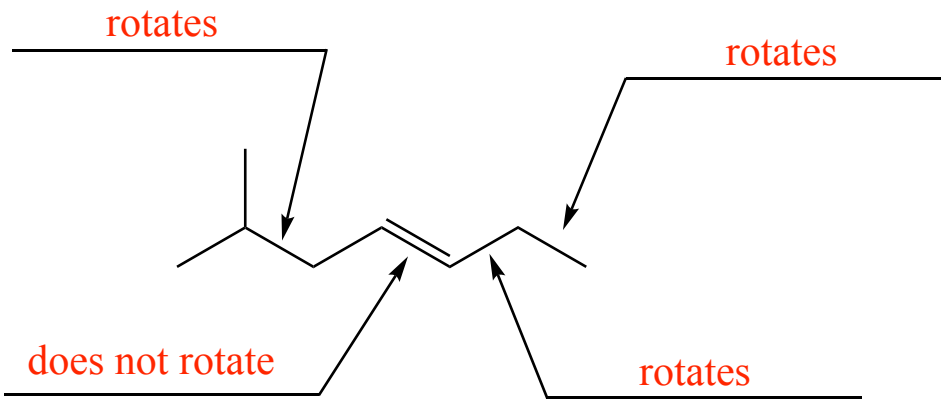


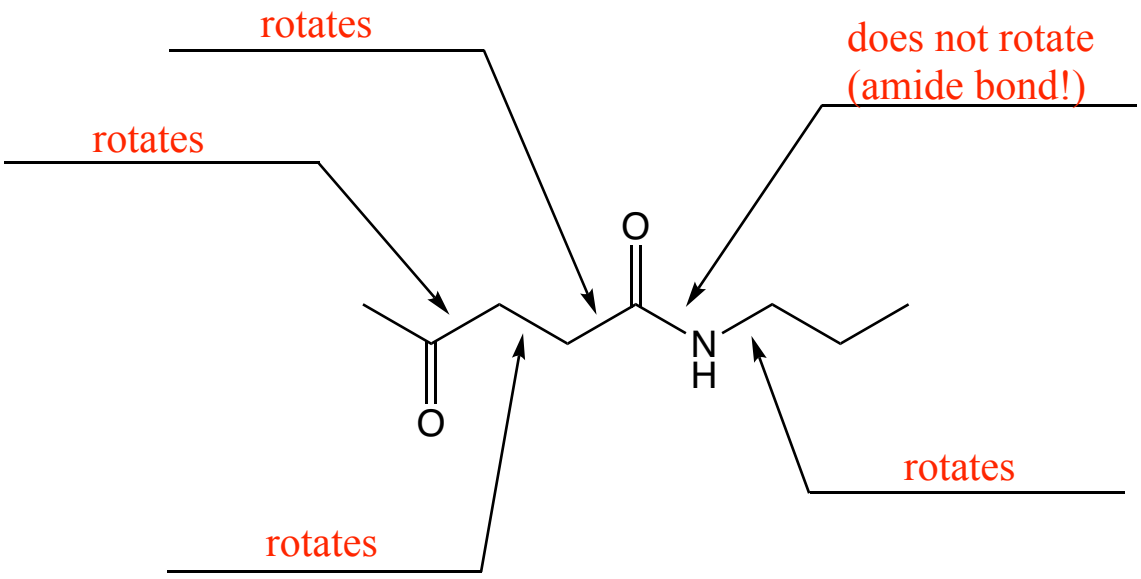


$(H_3C)_3C-(CH_2)_5\text{-}CHOH-CO_2H$

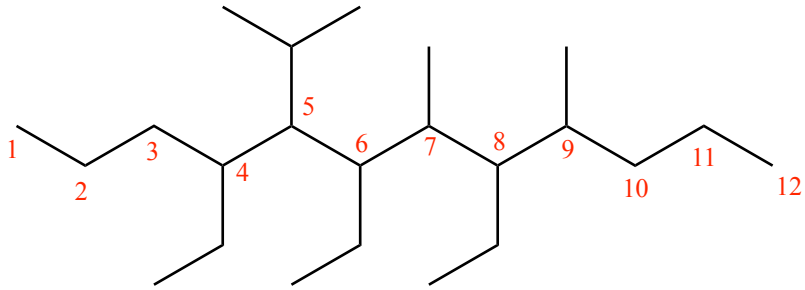


2) (1 pt each) In the space provided, write "rotates" if the bond indicated by the arrow can rotate freely at room temperature. Write "does not rotate" if the indicated bond cannot rotate at room temperature.





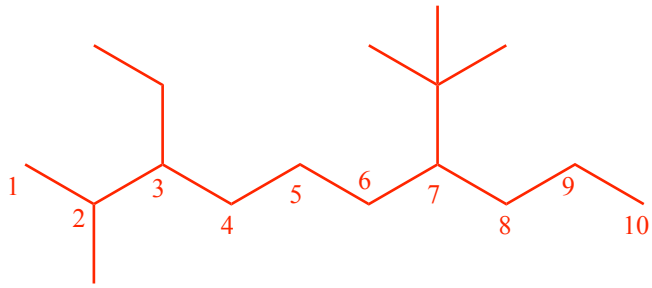
3) (3 pt) One last nomenclature question for you! This is a complicated one! On the line provided, write IUPAC name of the following molecule.



4,6,8-triethyl-5-isopropyl-7,9-dimethyldodecane
4,6,8-triethyl-7,9-dimethyl-5-(1–methylethyl)dodecane

4) (3 pt) In the box provided, make a line-angle drawing of the following molecule:

3-Ethyl-2-methyl-7-(1,1-dimethylethyl)decane



5. (2 pts each) Fill in each blank with the word or words that best completes the sentences.

For organic chemistry, it is best to think of _____electrons_____ as waves.

According to the valence bond approach, the atomic orbitals on each atom are combined first to create _____hybridized_____ orbitals, that overlap to create _____sigma_____ bonds.

Three (or more) atom "pi-ways" are the situation resonance _____contributing_____ structures are usually trying to describe. For pi bonding and therefore pi delocalization to occur over more then two atoms (i.e. pi-ways), parallel and overlapping _____2p_____ orbitals are needed on ALL of the adjacent atoms involved. As a result, all of the atoms involved in pi-ways are usually _____sp^2_____ hybrized, and NEVER _____sp^3_____ hybridized.

6. (1 pt each) For the following TRUE and FALSE questions, CIRCLE "T" FOR ALL OF THE TRUE STATEMENTS AND "F" FOR ALL OF THE FALSE STATEMENTS This is not meant to be tricky, but please read the statements carefully so that you do not make any careless errors. We are not attempting to trick you here with complicated statements, but you still might want to take your time on these.

(T) F A. Resonance contributing structures do not represent equilibrating structures, rather the hybrid (blending) of them is the true molecular representation.

T (F) B. When drawing resonance contributing structures you generally move atom nuclei and sigma bonds.

(T) F C. When drawing resonance contributing structures, you generally move pi bonds (*one* bond of a double or triple bond) and lone pair electrons, not atom nuclei or sigma bonds.

T (F) D. For organic chemistry, it is best to think of electron density as particles, described by Newton's laws.

(T) F E. For organic chemistry, it is best to think of electron density as waves, described by wave equations.

(T) F F. A C atom is sp^2 hybridized if it has one pi bond and three sigma bonds

(T) F G. A C atom is sp hybridized if it has two pi bonds and two sigma bonds

(T) F H. A C atom is sp^3 hybridized if it has four sigma bonds and no pi bonds

(T) F I. A sigma bond occurs when the majority of the electron density is found on the bond axis.

T (F) J. A pi bond occurs when the majority of the electron density is found on the bond axis.

T (F) K. A C atom is sp^2 hybridized ONLY if ALL contributing structures have one pi bond and three sigma bonds.

T (F) L. A C atom is sp^3 hybridized EVEN if ONLY one important contributing structure has one pi bond and three sigma bonds.

(T) F M. A C atom is sp^2 hybridized EVEN if ONLY one important contributing structure has one pi bond and three sigma bonds.

T (F) N. When considering the pi bonding in an amide, remember that three 2p orbitals overlap to create two pi molecular orbitals involving only the O and N atoms.

(T) F O. When considering the pi bonding in an amide, remember that three 2p orbitals overlap to create three pi molecular orbitals involving the central C atom as well as the O and N atoms.

(T) F P. Molecular orbital theory is based on mathematically combining all of the component atomic orbitals in a molecule, creating new molecular orbitals that extend over the entire molecule.

T (F) Q. For this class, it is best to think of sigma bonds using molecular orbital theory, and pi bonds using valence bond theory.

(T) F R. For this class, it is best to think of sigma bonds using valence bond theory, and pi bonds using molecular orbital theory.

(T) F S. The most important question in chemistry is: Where are the electrons?