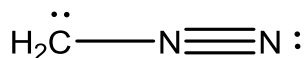
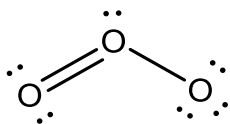
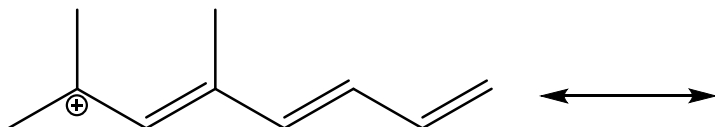


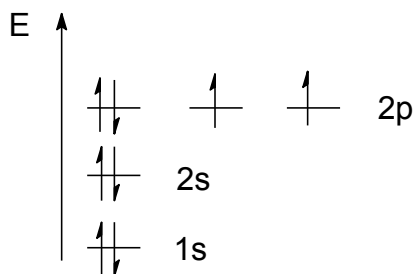
1. (4 pts) Calculate the formal charge on each **C**, **O**, and **N** in the structures below. All non-bonded electrons are shown.



2. (6 pts) Draw **THREE** more Resonance Structures for the carbocation intermediate shown below. Use arrows to show "pushing of electrons". Each resonance structure you draw should have the Positive Charge on a Different Carbon.



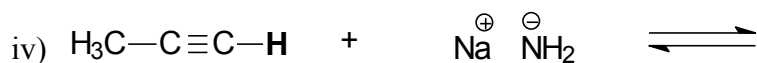
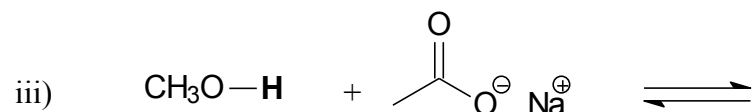
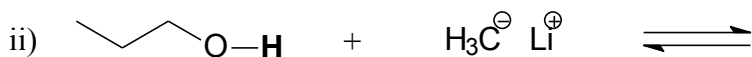
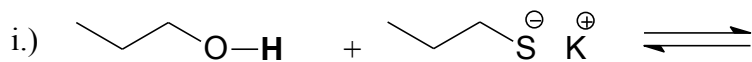
3. (5 pts) Draw an orbital energy level diagram for sp^3 hybrid Oxygen. The electron count for unhybridized Oxygen is $1s^2 2s^2 2p^4$.



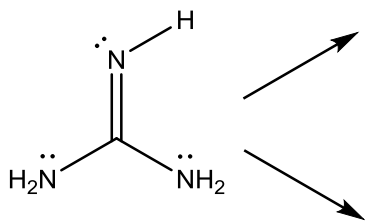
4. For each acid-base reaction shown below (the acid is on the left, the base is on the right, the proton which is of interest is drawn in **BOLD**):

A) (8 pts) Draw the structures of the conjugate acid and conjugate base.

B) (4 pts) Decide whether the equilibrium favors the FORWARD reaction, the REVERSE reaction, or NEITHER.



5. (10 pts) Protonation of Guanidine at Nitrogen can produce two different conjugate acids. Draw the structures of each conjugate acid. Which conjugate acid is more stable? Explain your choice carefully.



6. (9 pts) Draw an acceptable structure for each of the following:

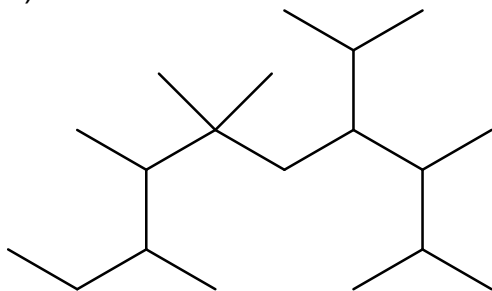
A) 6-isopropyl-3,4,4,7,8-pentamethyldecane

B) 4-isobutyl-6-isopropyl-1,1-dimethylcyclooctane

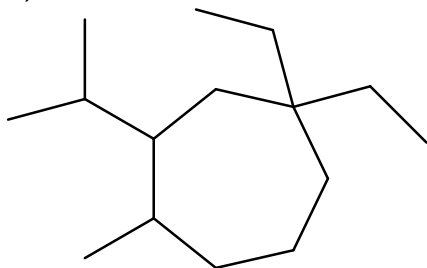
C) bicyclo[2.2.2]octane

7. (9 pts) Provide an acceptable name for each of the following structures:

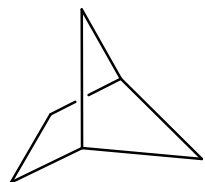
A)



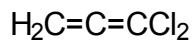
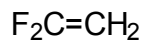
B)



C)

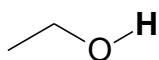


7. (8 pts) Draw a 3-D representation of each of the following molecules. Use wedges and dashes where needed to clearly indicate geometry. Indicate the direction of the Dipole (\rightarrow) for each molecule.

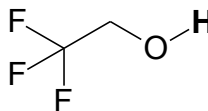


9. (8 pts) For each pair of compounds, indicate which one is the stronger acid (*i.e.* – the **H** in **BOLD**). For full credit, draw the structure of each conjugate base, and provide a brief explanation.

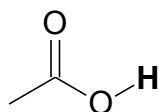
A)



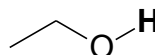
vs.



B)



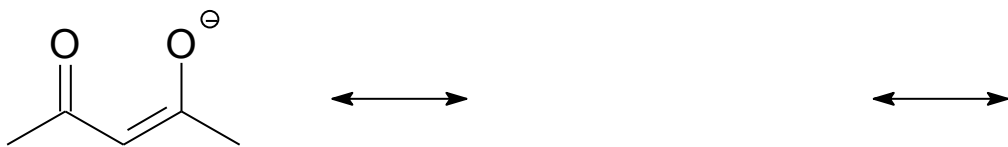
vs.



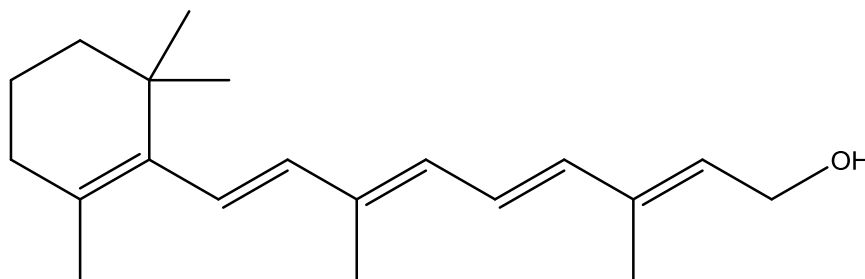
10. (10 pts) Draw a complete set of 6 Newman Projections for 2-methylbutane, considering rotation about the C2-C3 bond. Indicate which structure(s) are MOST stable and LEAST stable.

11. (5 pts) Draw FIVE different dimethylcyclopentane isomers (including *cis* and *trans* isomers).

12. (6 pts) Draw two more resonance structures for the intermediate shown below. Use arrows to show "pushing" of electrons:



13. (4 pts) Circle all of the atoms in the structure below that are sp^2 hybrid.



14. (4 pts) Draw the Resonance Hybrid (the weighted average of the available resonance forms) of the resonance structures shown below:

