

Chemistry 3311-100
Organic Chemistry/Dr. Barney Ellison
Tuesday: Feb. 12th @ 7:00pm → 9:00 / 1st Exam / Hellems 252)

Name: _____ (please print)

1. (10 pts) Draw a proper 3 dimensional structure for the following compounds. Be sure to include any lone pair electrons.

a) propargyl nitrile, HCCCH_2CN

b) methyl butanoate, $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOCH}_3$

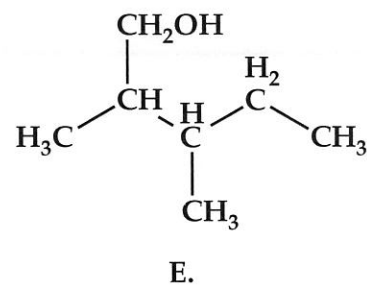
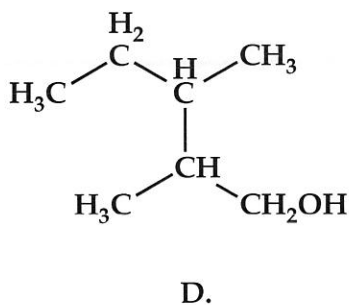
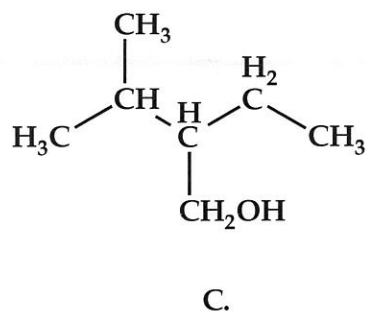
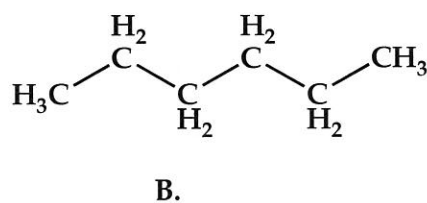
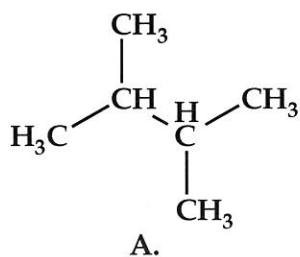
2. (10 pts) Draw the structure of nitric acid, HO-NO₂

a) How much negative charge is on each oxygen atom?

b) What is the bond order for each nitrogen-oxygen in nitric acid?

3. (10 pts) What are the names of compounds (A and B). Are they isomers or are they the same species?

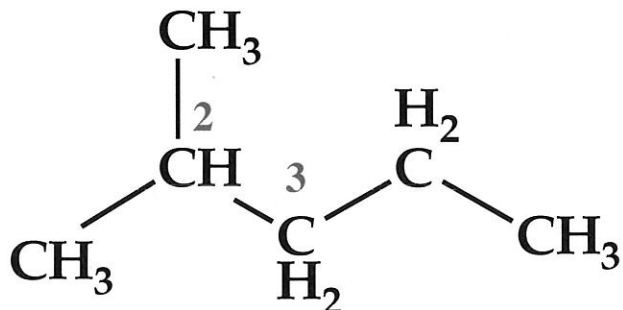
What are the names of compounds (C, D, and E). Are they isomers or are they the same species??



4. (10 pts) The energy required to rotate about the CC bond in $\text{ClCH}_2\text{-CH}_2\text{Cl}$ is only 3 kcal mol^{-1} while that to rotate about the CC bond in CHCl=CHCl is 60 kcal mol^{-1} . Why is this?

5. (15 pts)

a) Draw a Newman projection for each conformation of 2-methylpentane:

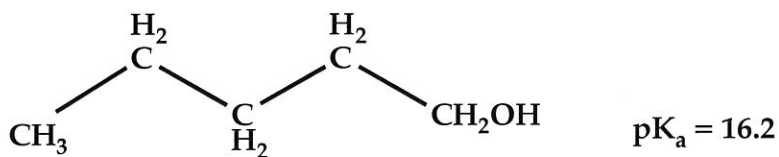
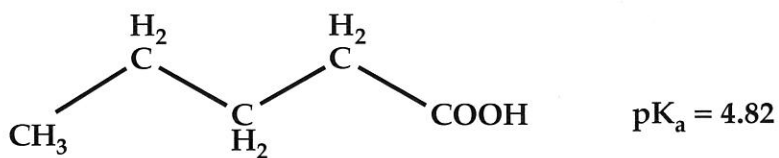
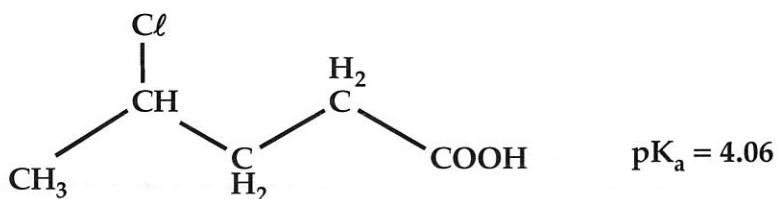
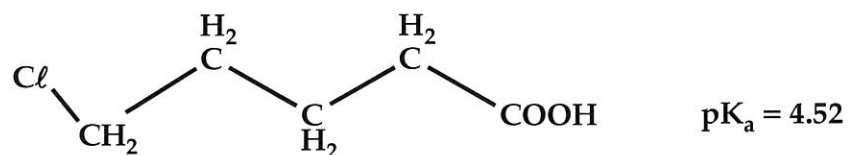
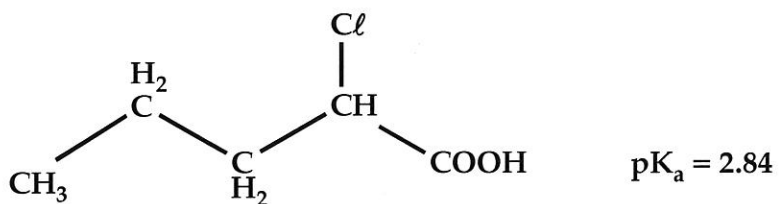


Show both the staggered and eclipsed conformations about the $\text{C}_2 - \text{C}_3$ bond indicated above.

b) Sketch the shape of the curve of potential energy *vs* dihedral angle for 2-methylpentane.

c) Which conformations are likely to be present in greatest amount at room temperature?

6. (15 pts) Consider the compounds and their pK_a s.

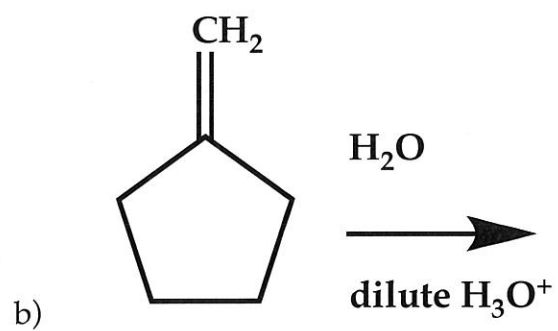
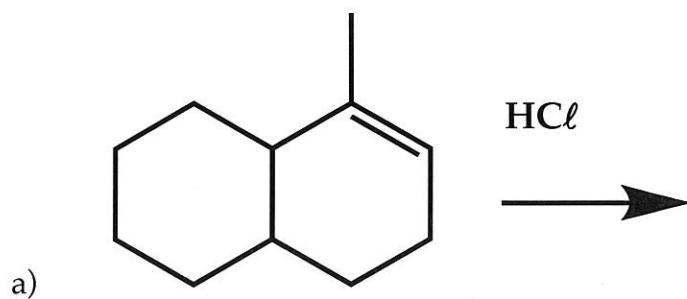


1) For each species, what is the dissociation constant, K_a ?

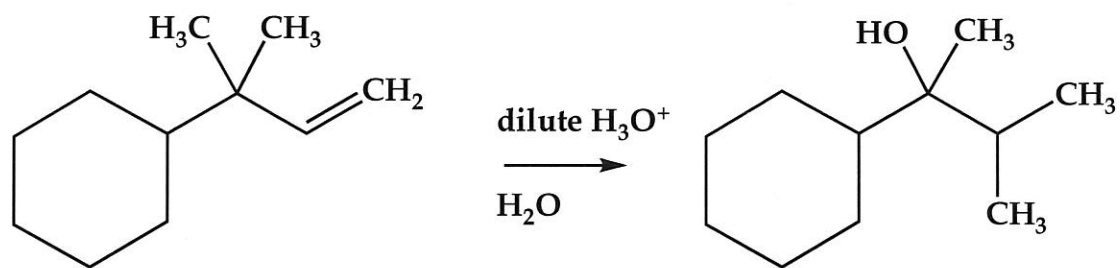
2) Rank these compounds by their acidity. Which is most acidic?

3) What is the structural basis for this variation in acidity ?

7. (10 pts) What are the products of the following reactions? Provide a mechanism for the reaction.



8. (10 pts) Propose a mechanism for the following reaction?



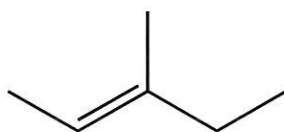
9. (10 pts) Consider the alkenes below. Write the name of each compound below the structure. Recall that the more negative the heat of formation ($\Delta_f H_{298}$) is, the more stable the alkene is. Arrange the alkenes in order of stability.

less stable, higher in energy

more stable, lower in energy



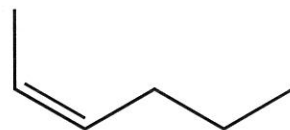
A



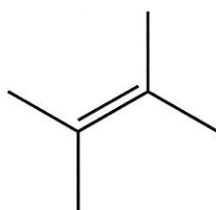
B



C



D



E