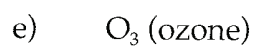
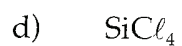
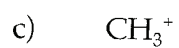
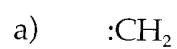


Chemistry 3311-100
Organic Chemistry/Dr. Barney Ellison
Thursday: Feb. 11th @ 7:00pm → 9:00/1st Exam/Math 100)

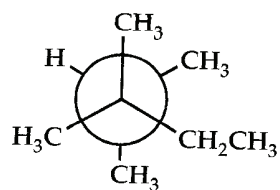
Name: _____ (please print)

1. (10 pts) Predict the approximate bond angles in each of the following molecules:

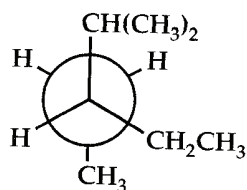


2. (10 pts) Within each set, which two structures represent the same compound?

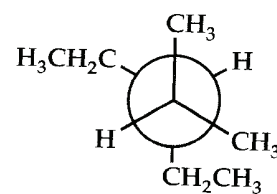
a)



A

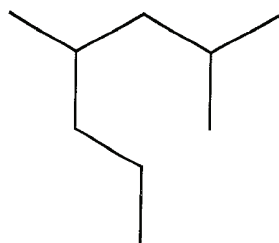


B

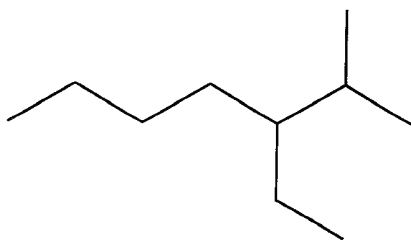


C

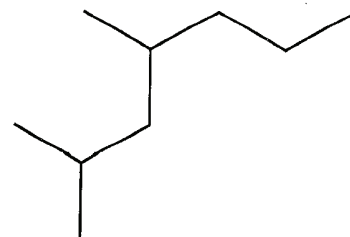
b)



A

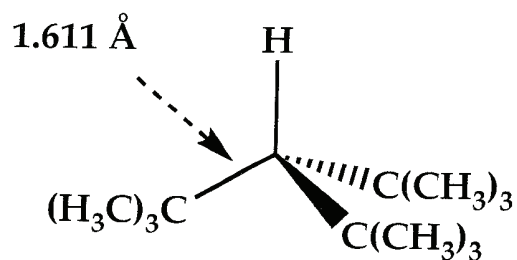


B



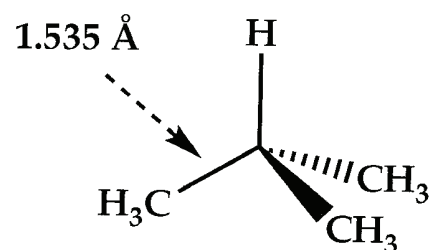
C

3. (10 pts) When the structure of compound A was determined in 1972, it was found to have an unusually long C—C bond and unusually large CCC bond angles when compared with compound B (isobutane)? Rationalize these findings.



CCC angle = 116°

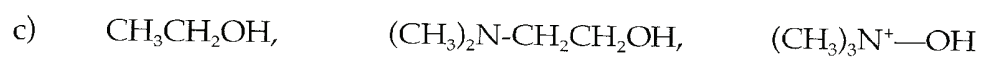
A



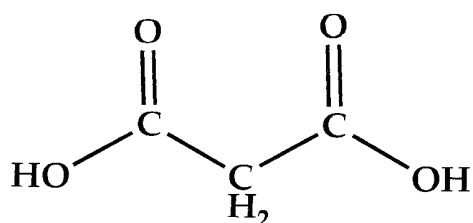
CCC angle = 110.8°

B

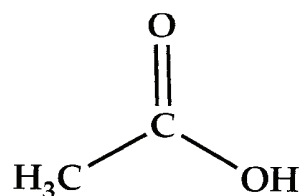
4. (12 pts) Arrange the compounds in each of the following sets in order of decreasing pK_a , highest first. Explain your reasoning.



5. (18 pts) Malonic acid has two carboxylic acid groups and consequently undergoes two ionization reactions. The pK_a for the first ionization is 2.86, the pK_a for the second ionization is 5.70. The pK_a for acetic acid is 4.76.



malonic acid

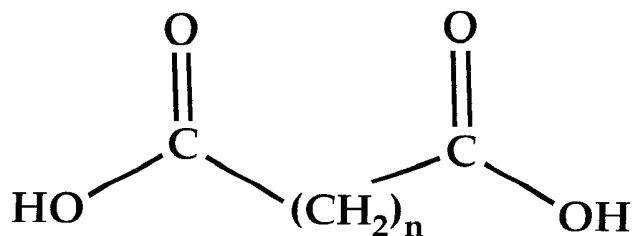


acetic acid

a) Write out the equations for the first and second ionizations of malonic acid, and label each with the appropriate pK_a value.

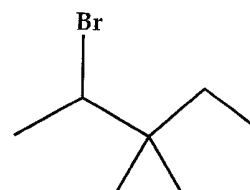
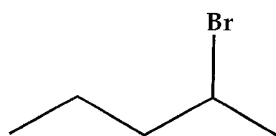
b) Why is the first pK_a of malonic acid much lower than the pK_a of acetic acid but the second pK_a of malonic acid is much higher than the pK_a of acetic acid?

c) Malonic acid is a dicarboxylic acid.



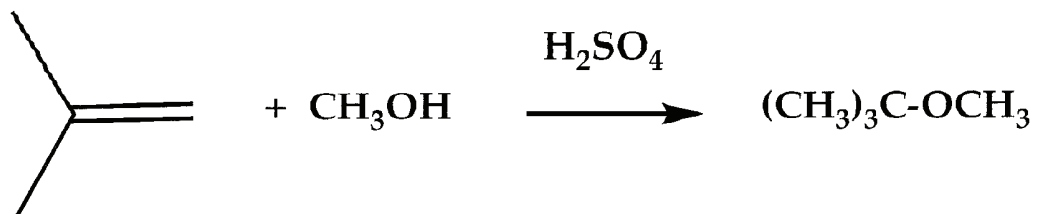
How would the difference between the first and second pK_a values change as n increases?

6. (10 pts) Only one of the following three alkyl halides can be prepared as the major product of the addition of HBr to an alkene. Which compound can be prepared in this way? Explain why the other two cannot be prepared in this way.



7. (10 pts) The alkene 3,3 dimethyl-1-butene undergoes acid-catalyzed hydration with rearrangement. Show the product of the rearrangement and write a mechanism.

8. (10 pts) The industrial synthesis of methyl *tert*-butyl ether is:



Write a mechanism.

9. (10 pts) Write a mechanism for the following reaction.

