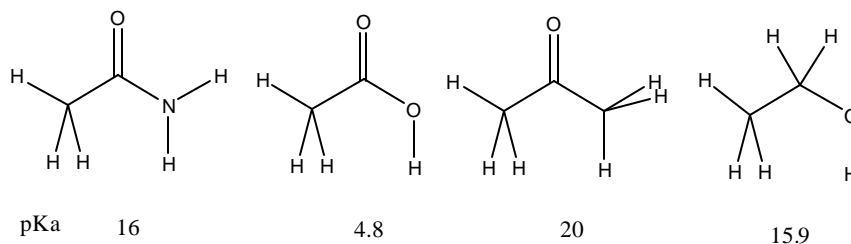


Whittier College
Organic Chemistry: CHEM 331
Test # 1
100 Points Total

September 22, 2000

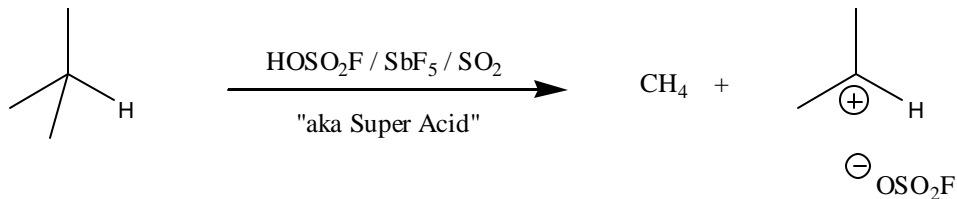
Name: _____

1. Consider the following molecules with the following pKa values: (25 points)



- 1a. What is an acid? What factors are involved in making an acid a strong acid?
- 1b. Circle the MOST Acidic atoms for each molecule.
- 1c. Number the molecules in the order from most acidic (1) to least acidic (4).
- 1d. Thoroughly explain your reasoning behind the ordering of the molecules. Include a discussion of the meaning of pKa and why the characteristics of each specific molecule help us understand the pKa for EACH molecule. Discussing them in order may be appropriate.

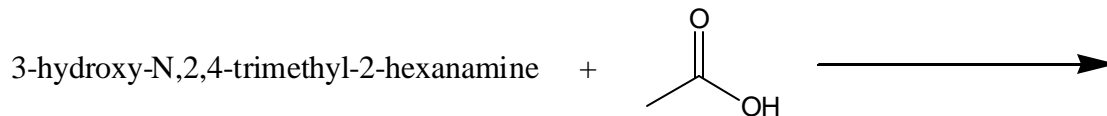
- 1e. Mixtures of fluorsulfonic acid and antimony pentafluoride in sulfur dioxide as solvent have been called a "Super Acid". Knowing what you know about acids, consider the following reaction.



Explain the reaction. What reacted with what? Be specific and use curved arrows to show the movement of electrons. What kind of reaction is it?

2. Consider and explain thoroughly the following questions: (25 points)
- 2a. What is a base? What factors are involved in determining the strength of a base?
- 2b. Draw the structure for 3-hydroxy-N,2,4-trimethyl-2-hexanamine.
- 2c. Is this molecule a base? Circle the atom(s) that is(are) basic? Explain.

2d. Consider the following reaction:



What is (are) the product(s) of this reaction? Make sure that you show the movement of electrons using arrows to explain the formation of the product(s). In which direction does the equilibrium favor? Explain.

3. Consider and explain thoroughly the following questions: (25 points)

3a. What is a nucleophile? Give an example and explain.

3b. What is an electrophile? Give an example and explain.

3c. Draw a specific example of a reaction between a nucleophile with an electrophile. Do not use an acid / base reaction as an example. Explain this reaction in detail. Explain how dipoles, developing charges and curved arrows are used to explain the reaction.

4. Consider the following molecular formula: (25 points)



4a. What is a constitutional isomer?

4b. Draw four (4) constitutional isomers of $\text{C}_4\text{H}_9\text{ClO}$.

4c. Chose two (2) of the isomers and name the compounds.

4d. Choose one (1) of the isomers and label all carbons as either primary, secondary, tertiary or quaternary. Label the other major, non-carbon substituents as either primary, secondary, tertiary or quaternary.