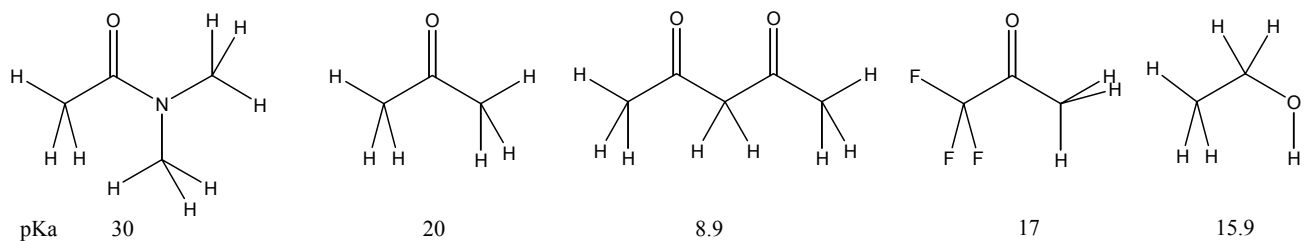


2. Consider the following molecules with the following pKa values: (25 points)



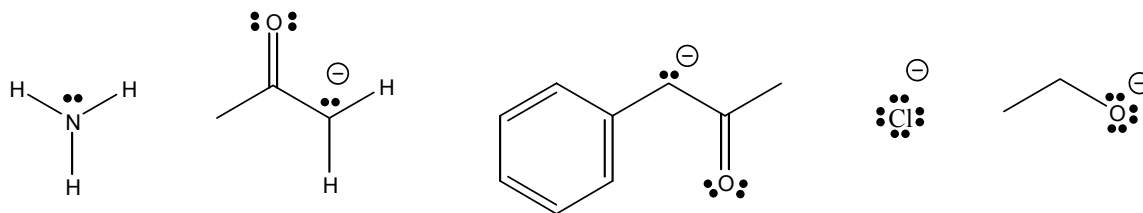
2a. What is an acid? What factors are involved in making an acid a strong acid? (10 points)

2b. Circle the MOST Acidic atom(s) for each molecule. (4 points)

2c. Number the molecules in the order from most acidic (1) to least acidic (5). (2 points)

2d. 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. (9 points)

3. Consider the following molecules: (25 points)



3a. What is a base? What factors are involved in making a base a strong base? (10 points)

3b. Circle the MOST basic atom(s) for each molecule. (4 points)

3c. Number the molecules in the order from most basic (1) to least basic (5). (2 points)

3d. Thoroughly explain your reasoning behind the ordering of the molecules. Include a discussion for why the characteristics of each specific molecule help us understand the basicity for EACH molecule. Discussing them in order may be appropriate. (9 points)

4. 2,6-dimethyl-4-isopropylheptane reacts with molecular chlorine in the presence of ultraviolet light and yields several products. In the absence of light, no reaction occurs. In the absence of chlorine, no reaction occurs. In the absence of 2,6-dimethyl-4-isopropylheptane, the greenish color of the chlorine disappears when the reaction is irradiated with ultraviolet light but reappears after the light is removed. For every photon of light, 1574 molecules of the various products are formed. (33 points)
- 4a. What is the structure of the starting material? (2 points)
- 4b. What kind of reaction is this? (3 points)
- 4c. What are the products of this reaction? Provide a name for two of the products. (10 points)
- 4d. What percentage would you expect for each product? Briefly explain. (5 points)
- 4e. Choose one of the products, and draw a mechanism that explains the stated experimental results and formation of that product. Briefly explain how each part of your mechanism explains the experimental results stated in the problem. (10 points)

5. Consider the following molecular formulas: (21 Points)

5a. C_6H_{10}

5a1. How many elements of unsaturation exist for this molecular formula? What does that mean? (2 points)

5a2. Choose one constitutional isomer and draw it in two different conformations. (4 points)

5b. $C_8H_{10}O$

5b1. How many elements of unsaturation exist for this molecular formula? What does that mean? (2 points)

5b2. Choose one constitutional isomer and draw it in two different conformations. (4 points)

5c. $C_7H_{13}ClO$

5c1. How many elements of unsaturation exist for this molecular formula? What does that mean? (2 points)

5c2. Choose one constitutional isomer and draw it in two different conformations. (4 points)

5d. Provide a name for one of the constitutional isomers drawn above. (3 points)