

Individual Assignment: Structure Influences Acidity and Basicity

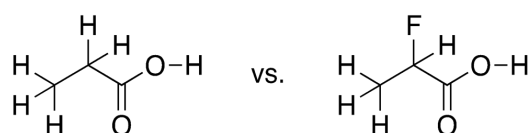
Description:

Relative acidity and basicity can be qualitatively predicted by analyzing the structure(s) being interrogated including conjugate bases and acids. For example, there are four factors to consider when comparing the stability of conjugate bases including: periodic trends, resonance stabilization, induction, and orbital.

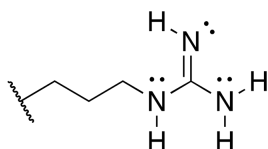
Instructions:

While you are learning this week content and working on the assignments prepare for Peer Review for next week (Tuesday) by answering the following questions individually.

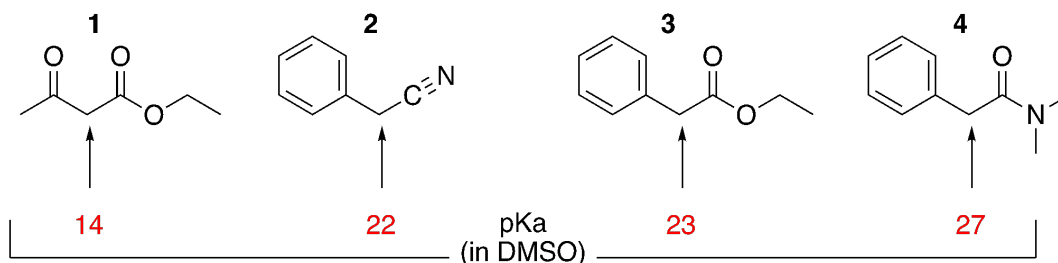
1. In one or two sentences or with an illustration, discuss how each of the four factors below play a role in determining relative acidity strength. In other words, discuss the general trends, be concise and specific.
 - a. Periodic Trends
 - b. Resonance
 - c. Induction
 - d. Orbitals
2. Analyze the two compounds below. Identify and circle the most acidic hydrogen in each structure. Then, determine which structure is most acidic overall. Discuss the factors that led you to this choice.



3. Analyze the structure below. Circle the nitrogen atom which is considered to be overall most basic. Provide a brief discussion to explain why this nitrogen is considered to be most basic (hint: think about the orbital each nitrogen lone-pair occupies). Draw relevant resonance structures of the conjugate acid expected to form when this structure is treated with 1 equivalent of HCl. Underline the resonance structure(s) that have filled octets everywhere.



4. The pK_a of the most acidic CH₂ group in each of the following compounds was measured in DMSO as solvent (reference: J. Org. Chem. 1981, 46, 4327–4331.)



Given the pK_a data above, propose an explanation why compound 1 is more acidic than compound 3.

Given the pK_a data above, propose which of the following two compounds below (**5** or **6**) is more acidic by comparing the stability of the corresponding conjugate bases. Include (ie. draw) all relevant resonance contributors in your discussion. Do any resonance structures have greater contribution than others to the overall stability? Underline the resonance structure that is considered to be most stable overall.

