

Names of all students (please print) _____

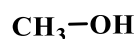
CHEM 243 Organic Chemistry I

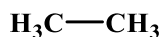
Points _____ (10 max)

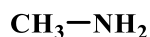
Worksheet #5: September 20, 2024. Complete the following worksheet by collaborating with a group of 3-4 students. You can use a text book or your lecture video notes. You must work together, with the names of all students included on **ONE** sheet and turned in for a group grade.

(1) Periodic Table Trends, Inductive Effects, Acid Strength and pKa's.

- (a) As you go **left-to-right** across a row of the periodic table, does acid strength **Increase** or **Decrease**? (circle)
- (b) As you go **top-to-bottom** down a column of the periodic table, does acid strength **Increase** or **Decrease**? (circle)
- (c) As the **distance** of an electronegative halogen atom from an acid proton **increases**, the acid pKa also increases. Is this statement **TRUE** or **FALSE**? (circle your answer)
- (d) The strength of three organic acids is being compared. Acid (A) has two Br atoms, acid (B) has one Br atom, and acid (C) does not have any halogen atoms. Which is the strongest acid? **ANSWER** _____
- (e) Rank the four molecules below in order of **increasing** acidity (1 = weakest.....4 = strongest).









- (f) Rank the following molecules in order of increasing acidity (1 = weakest.....4 = strongest).

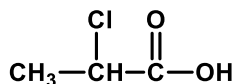


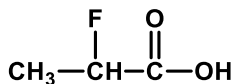


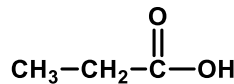


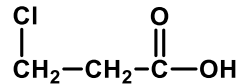


- (g) Rank the following molecules in order of **increasing** acidity (1 = weakest.....4 = strongest).

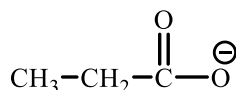


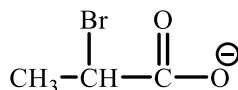


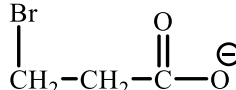


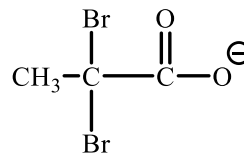


- (h) Rank the following molecules in order of **increasing base strength** (1 = weakest.....4 = strongest). Hint: The weakest base will form the strongest conjugate acid.



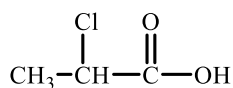


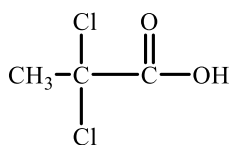


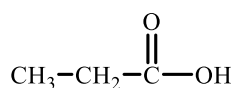


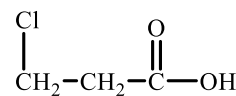
- (i) As the strength of a series of acids **decreases**, will their pKa values **increase** or **decrease**? (circle your answer)

(j) Match the following pKa values to the acids drawn below: **4.86** **3.98** **1.48** **2.83**





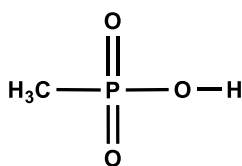




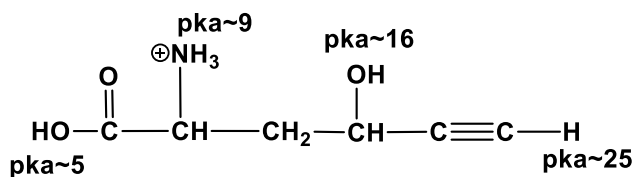
(2) **Acid/Base Resonance Structures.** For the acid below,

- Draw the conjugate base;
- Draw all resonance structures of the conjugate base;
- Draw the resonance hybrid.

Note: Although its true that the connectivities are the same, resonance structures differ in the location of electron pairs.
HINT: There are a total of three Resonance Structures.

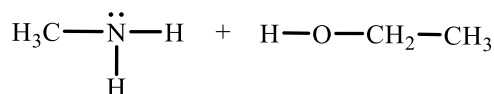


(3) **Effect of pH on Acid/Base Structure.** Draw the structure of the compound below at **pH 11**.



(4) **Acid/Base Mechanisms.** Complete the organic acid/base reaction shown below by:

- Identifying and labeling the acid and base reactants;
- Using curved arrows to indicate the base “grabbing” the acidic “H” from the acid;
- Drawing the structure of and labeling the conjugate acid and base;
- Assigning appropriate pKa values to the acid species in the reactants and products;
- Drawing equilibrium arrows that clearly show in which direction the reaction is favored.



(5) REVIEW: Comparing Organic Structures. Are the following pairs of compounds:

Identical or Different or Constitutional Isomers?

