

Names of all students (please print) _____

CHEM 243 Organic Chemistry I

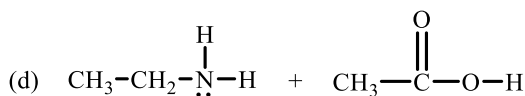
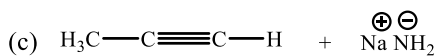
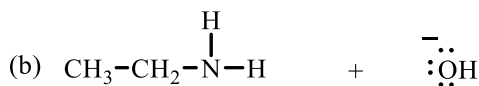
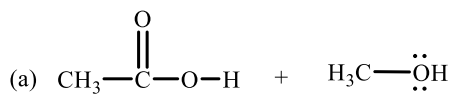
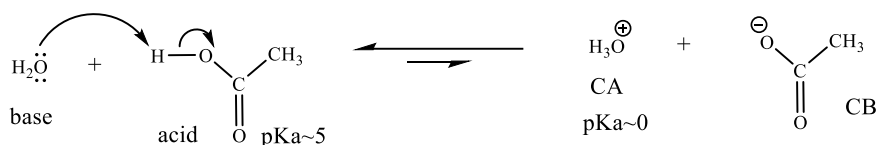
Points _____ (10 max)

Worksheet #5: September 15, 2021. 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) Acid/Base Mechanisms. Complete each organic acid/base reaction shown below by:

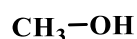
- Identifying and labeling the acid and base reactants;
- Using curved arrows to indicate electron pair movement;
- Drawing the structure of and labeling the conjugate acid and base;
- Assigning appropriate pKa values to the acid species in the reactants and products;
- Drawing equilibrium arrows that clearly show in which direction the reaction is favored.

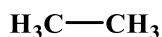
Example:

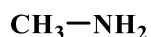


(2) Periodic Table Trends, Inductive Effects, Acid Strength and pKa's.

- (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).

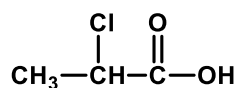


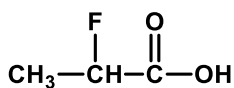


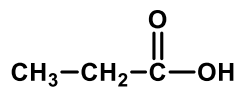


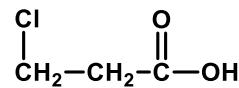


- (g) Rank the following molecules in order of **increasing** acidity (1 = weakest.....4 = strongest).

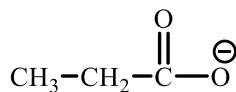


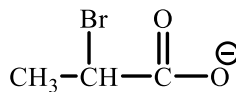


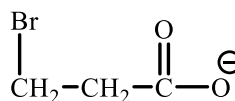


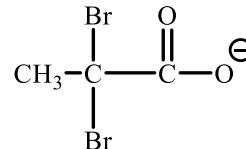


- (h) Rank the following molecules in order of **increasing base strength** (1 = weakest.....4 = strongest). Hint: The weakest base will form the strongest conjugate acid.









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

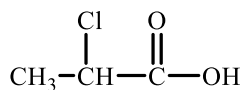
- (j) Match the following pKa values to the acids drawn below:

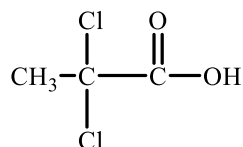
4.86

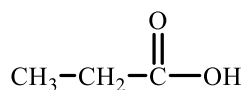
3.98

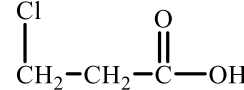
1.48

2.83





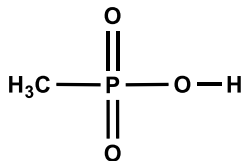




(3) Acid/Base Resonance Structures. For the acid below,

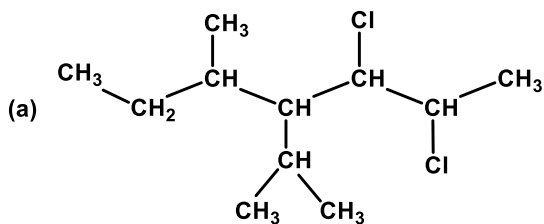
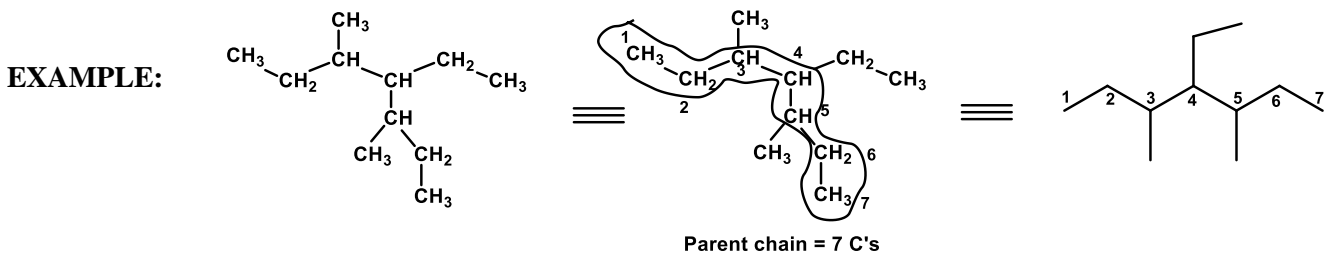
- Draw the conjugate base;
- Draw all resonance structures of the conjugate base;
- Draw the resonance hybrid.

Note: You may be confused in that all the resonance structures appear identical. Although its true that the connectivity is the same, resonance structures differ in the location of electron pairs. **HINT: There are a total of three Resonance Structures.**

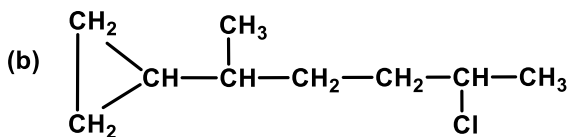


(4) REVIEW: Zig-zag (Bond-line) Structures. For each structure drawn below:

- Circle the "parent chain" (longest continuous carbon chain).
- Indicate the number of carbons in your parent chain.
- Based on the parent chain, draw an accurate zig-zag structure.



Carbons in parent chain: _____



Carbons in parent chain: _____ Hint: The C's in the ring are NOT part of the parent chain!