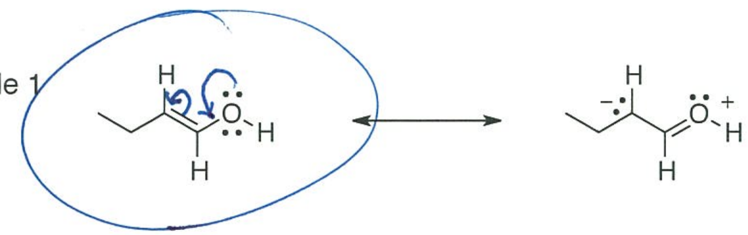
CHAPTER 2: RESONANCE THEORY

The Basics. Use the 'Rules for writing acceptable contributing structures' for this exercise (some hydrogens have been added for clarity).

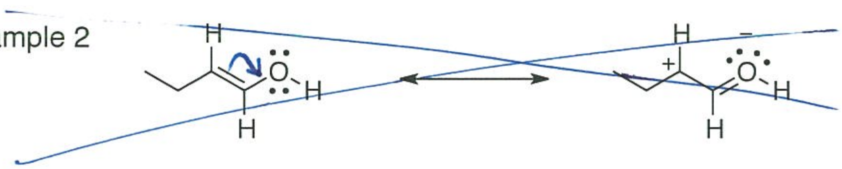
1. For each example, add curved arrows to the left structure to show a reallocation of elections that would result in the Lewis structure on the right.
2. SOME of the pairs are set up for you to violate a rule for drawing valid resonance structures. If the structure on the right is not a valid resonance structure of the molecule to its left (use the 'Rules for writing acceptable contributing structures'), place an X through the example. Use the space to the right of the example to provide a brief explanation of what the problem is.
3. If the example proposes a resonance structure that IS valid, use the 'Relative Importance of Resonance Contributing Structures' to identify and circle the preferred/most relevant resonance structure. Use the space to the right of the example to provide a brief explanation for your choice.

Example 1



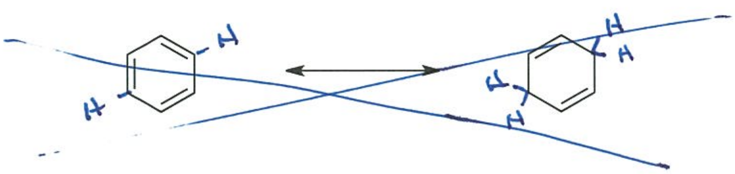
all atoms neutral

Example 2



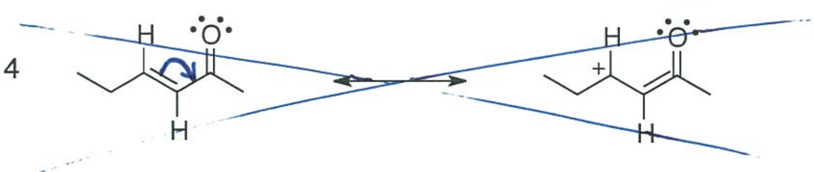
can't have 10 e⁻ @ oxygen

Example 3



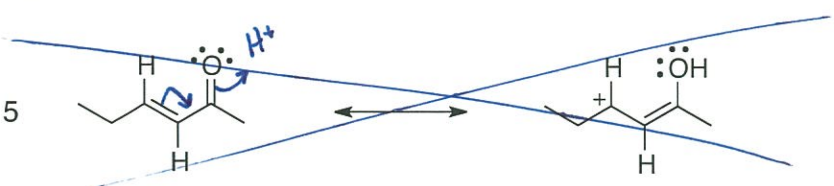
added atoms

Example 4



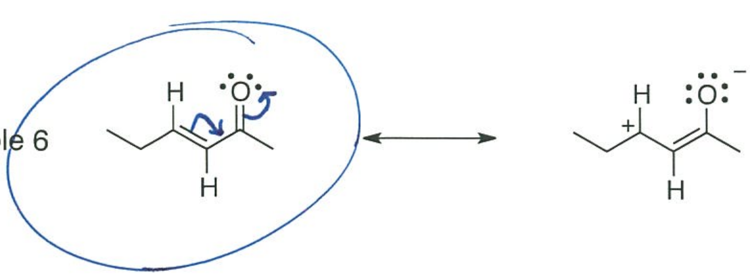
10 e⁻ @ carbon

Example 5



added atoms

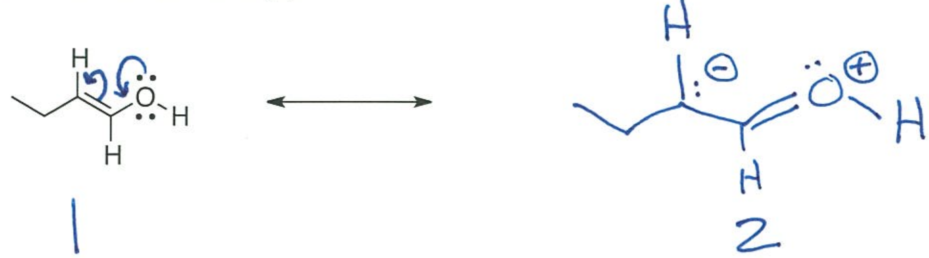
Example 6

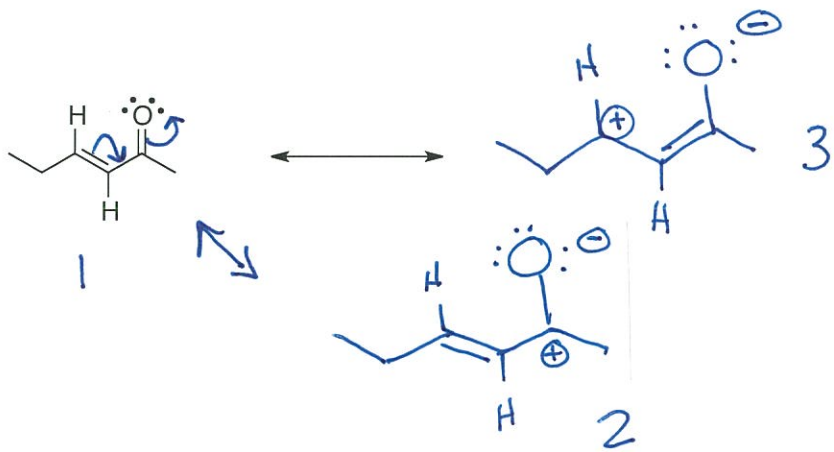


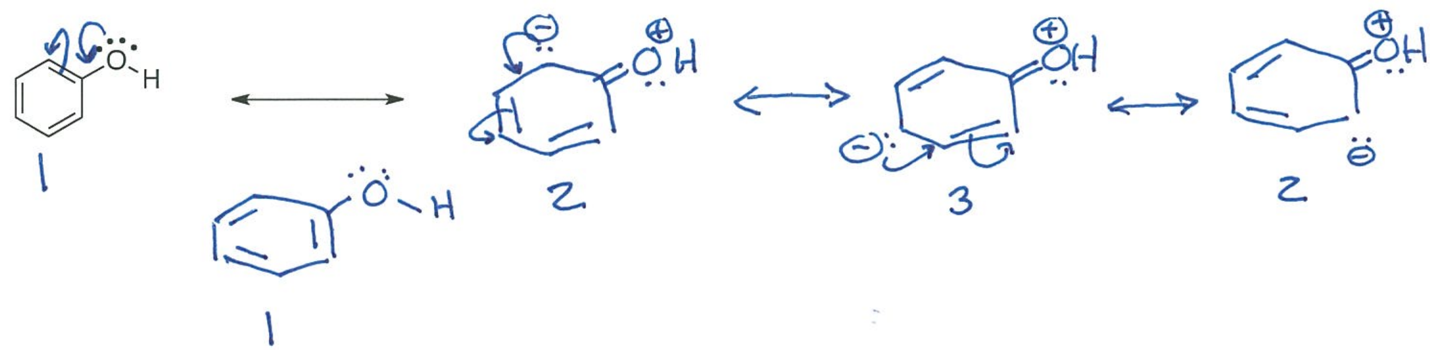
all atoms neutral

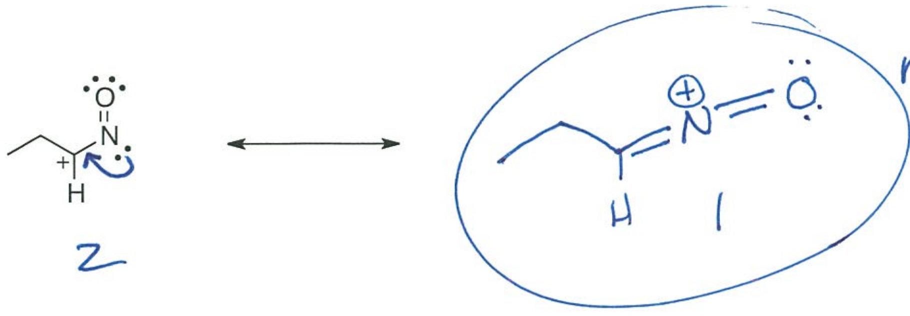
Now YOU draw the resonance structures. For each example below, draw all the *relevant* resonance structures that you can. When you're finished, use numbers to rank them in order of their relevance - where 1 is the best.

Make sure you draw curved arrows to show the sharing of electrons that lead to your new proposed resonance structure(s).





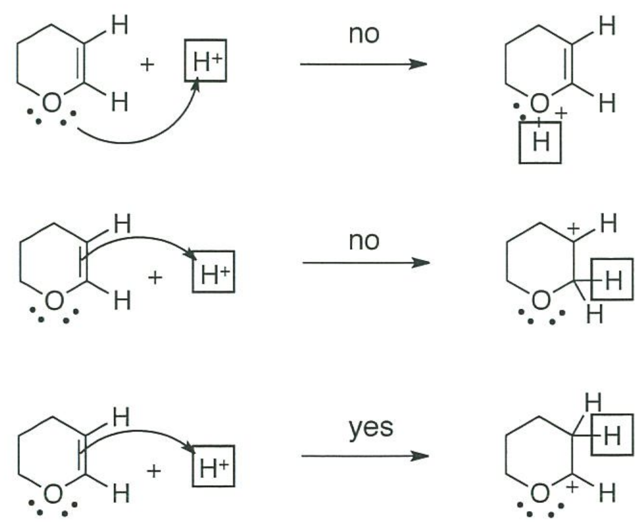


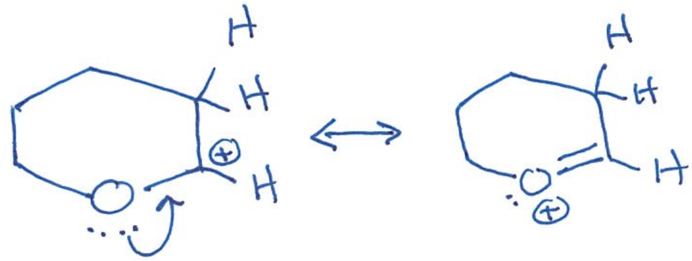


note sp hybridized N.

Now let's use resonance theory to describe some experimental data.

Example 1. When 3,4-dihydropyran is treated with acid (H^+), one of three reactions is possible (each are shown below). A box is added around the H^+ so you can follow where it goes on the right side of each of the reaction arrows. In reality, only the bottom reaction prevails. Use resonance theory/ structures to explain this.





This is the only structure that a resonance structure can be drawn for. Resonance theory shows the ⊕ is delocalized among two atoms, thus lowering the overall molecular energy. Low Energy = more stable