

the rules for using electron-pushing arrows
to draw the products of a mechanism step

<p>Number <i>all</i> the carbons in the starting materials, and in the products you draw. Number the products <i>consistently</i> with how you numbered the starting materials.</p>
<p>For each electron-pushing arrow: Erase a bond, or draw a new bond, or both. <u>Break a bond</u> when the tail of the electron-pushing arrow is on a bond. <u>Form a σ bond</u> when the arrow head is pointing to an atom which is not already sharing the electrons at the tail of the arrow. <u>Form a π bond</u> when the arrow head is pointing to a bond.</p>
<p>For each mechanism step: Change two formal charges. Make the atom that loses electrons at the <i>start</i> of the chain of arrows one step less negative— i.e., one step more positive. Make the atom that gains electrons at the <i>end</i> of the chain of arrows one step more negative— i.e., one step less positive. Do not change the formal charge for any atom in the <i>middle</i> of the series of arrows. THE MOST COMMON MISTAKE is forgetting to change the formal charge on the atom that loses electrons at the <i>start</i> of the chain of arrows.</p>

Don't draw the products you that you *expect* to see.
Instead, draw the products that *the arrows tell you* to draw.

<p>When drawing the products, what is the most important thing to get right? The formal charges.</p>
<p>Which charges do you change? Always change charges for <i>two</i> atoms: the atom that loses electrons at the <i>beginning</i> of the series of arrows, and the atom that gains electrons at the <i>end</i> of the series of arrows. Exception: for a "cycle" of arrows, don't change any charges.</p>
<p>Which charges do you not change? Never change the charge for an atom in <i>middle</i> of the series of arrows.</p>
<p>What is the most common mistake when drawing the products of mechanism step? The most common mistake is forgetting to change the formal charge for the atom that loses electrons at beginning of the series of arrows.</p>
<p>Which covalent bonds do you break? All covalent bonds at an arrow tail.</p>
<p>Which covalent bonds do you <i>not</i> break? All covalent bonds that are not at an arrow tail.</p>

how to draw difficult products for a mechanism step

<p>1. Number all the carbons in the starting materials for the step.</p>
<p>2. When drawing the products of the step, number each carbon before you write down the next carbon.</p>