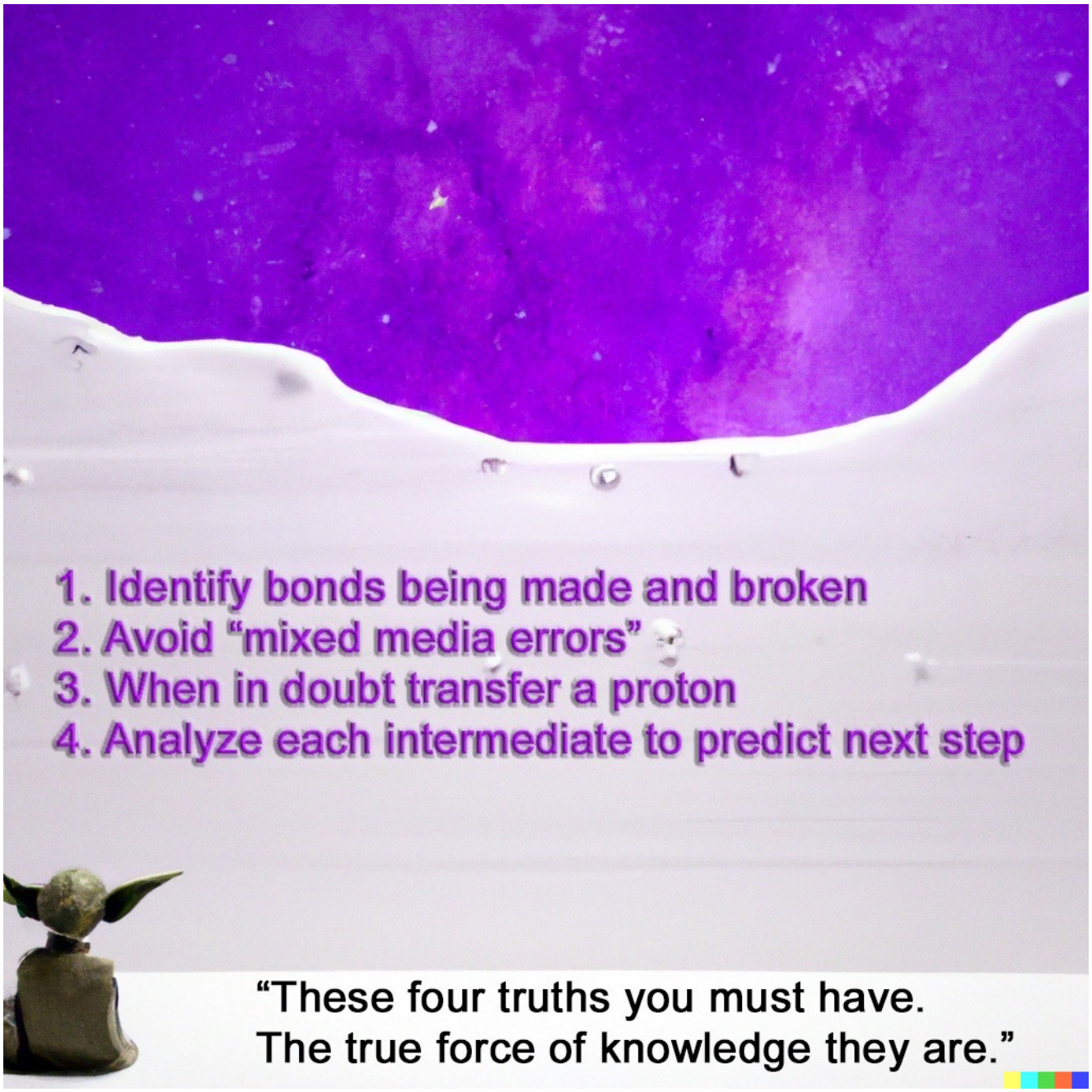

1. Identify bonds being made and broken
2. Avoid “mixed media errors”
3. When in doubt transfer a proton
4. Analyze each intermediate to predict next step
“These four truths you must have.
The true force of knowledge they are.”

For mechanisms, keep the following in mind:

1) Identify the bonds to be made and broken in the overall reaction

2) Avoid "mixed media errors"

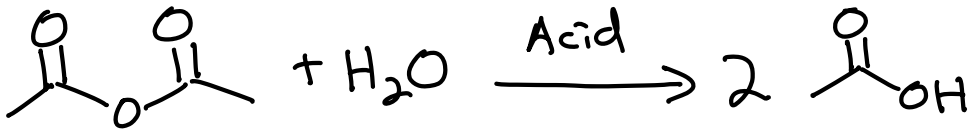
   a) In acid, all the intermediates are positively-charged or neutral

   b) In base, all the intermediates are negatively-charged or neutral

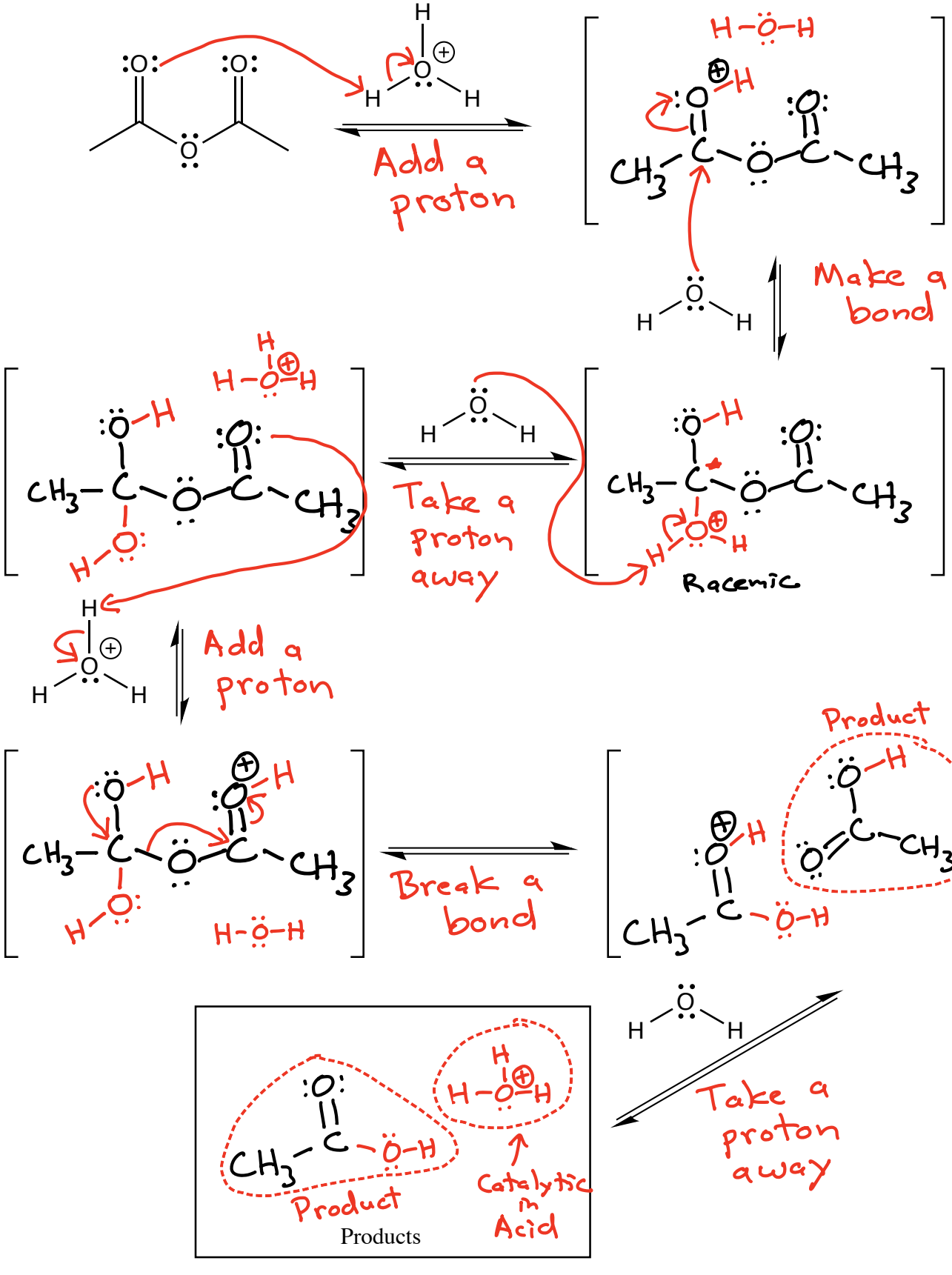
   c) In neutral solution → the intermediates could be positively-charged, negatively-charged or neutral

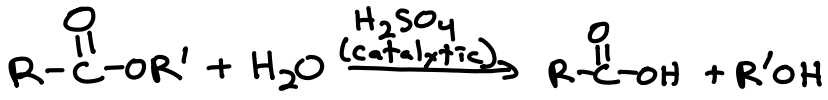
3) When in doubt transfer a proton → protons move very fast

4) Analyze each intermediate carefully to predict the next step

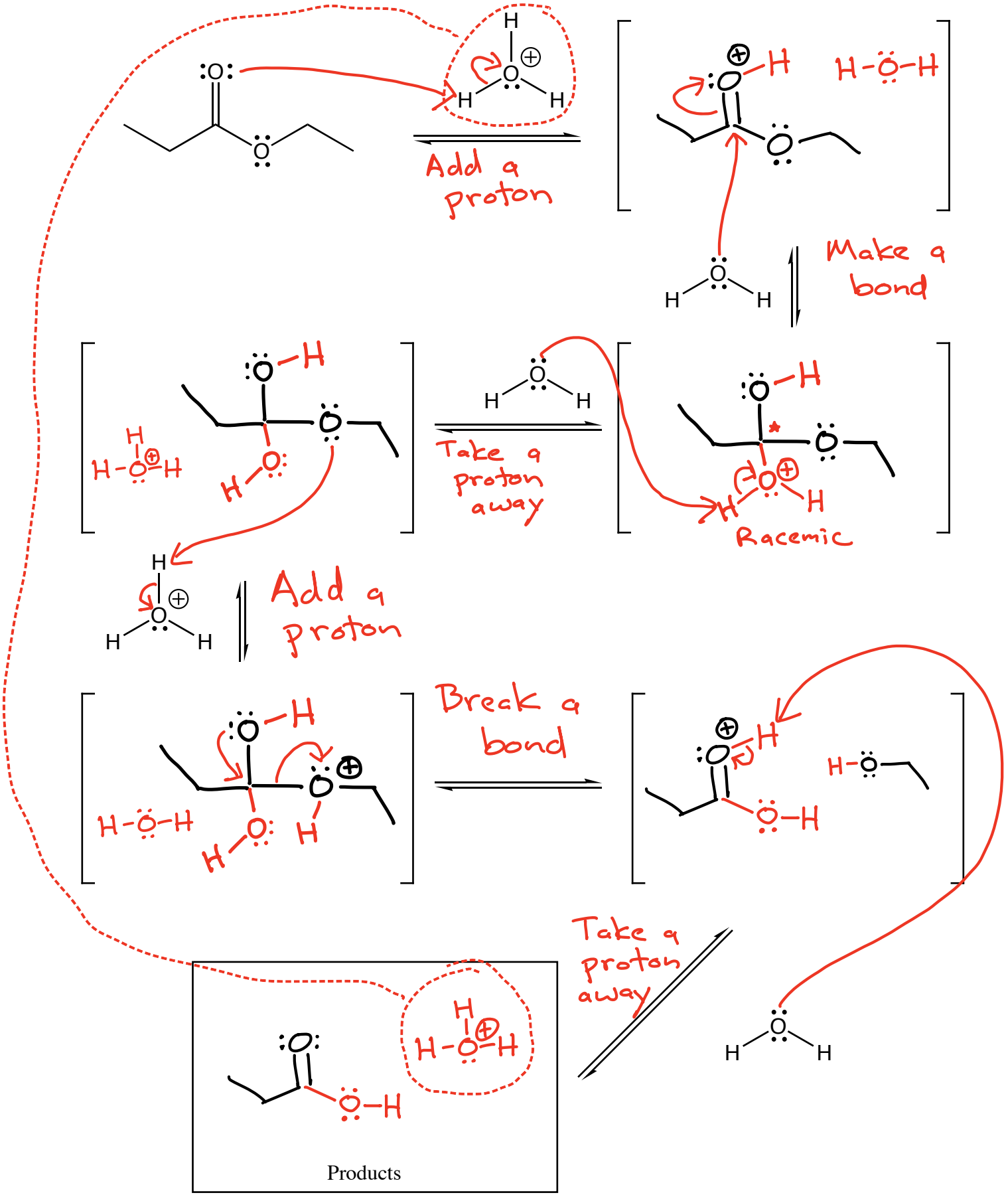


Acid Catalyzed Anhydride Hydrolysis

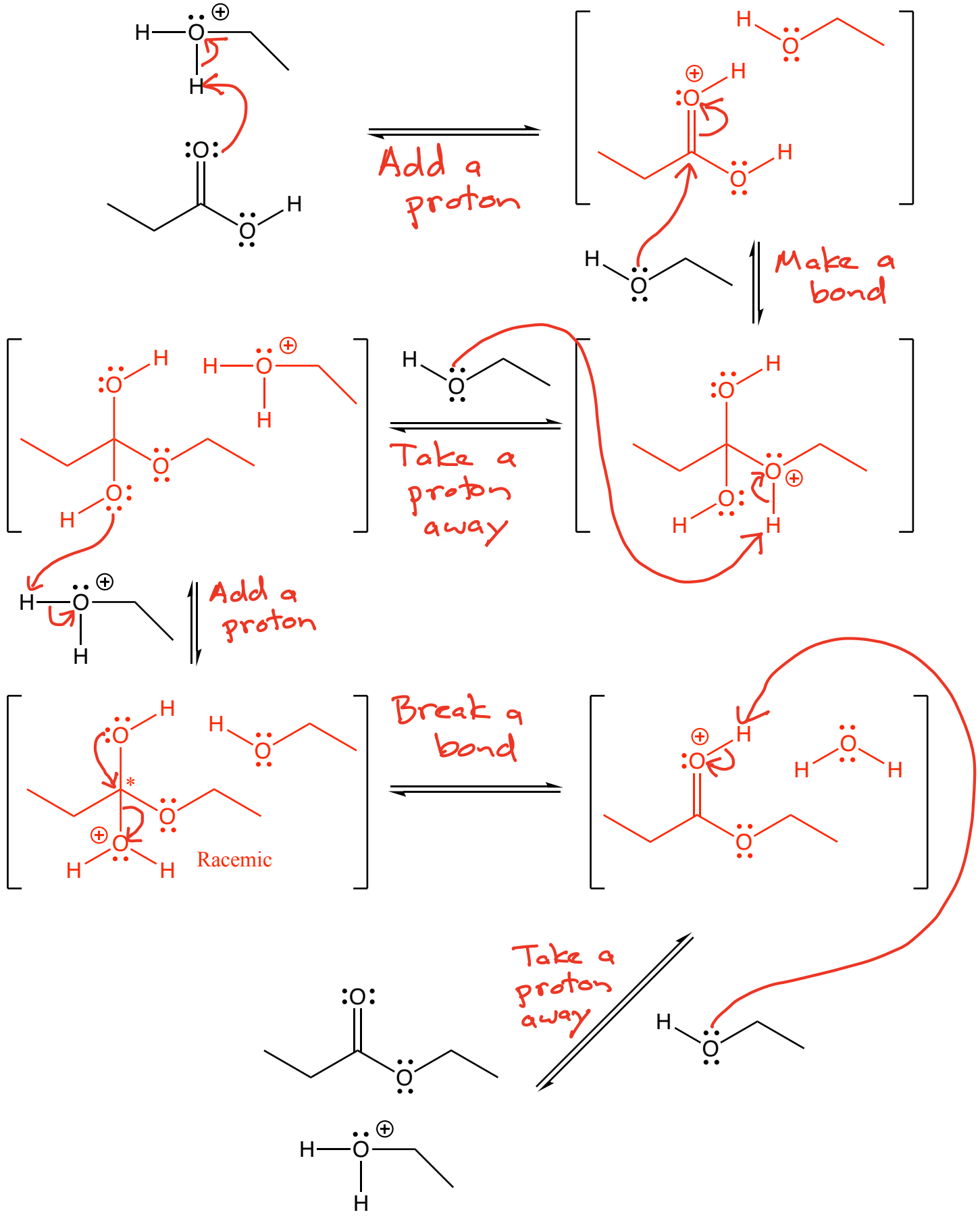




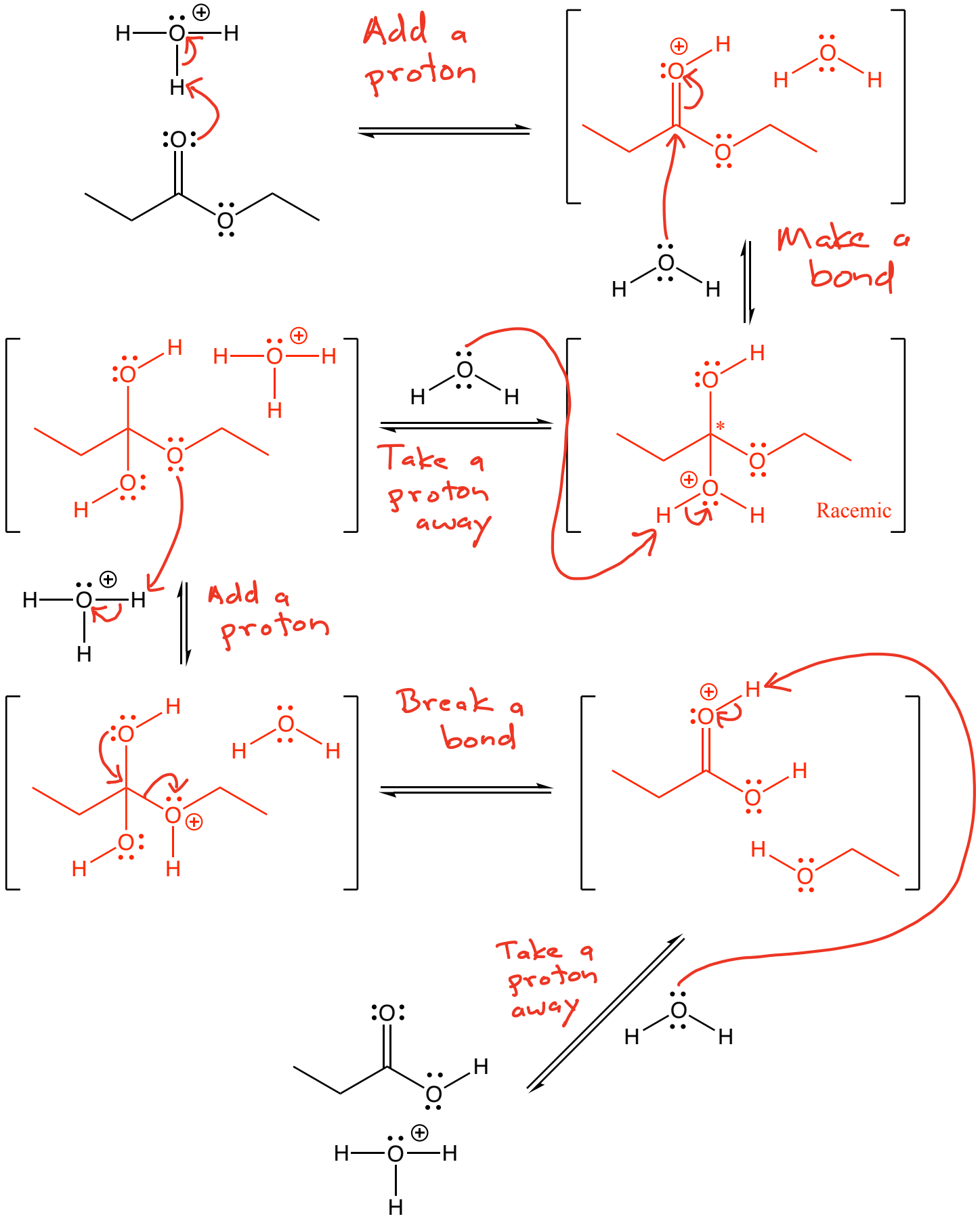
Acid Catalyzed Ester Hydrolysis



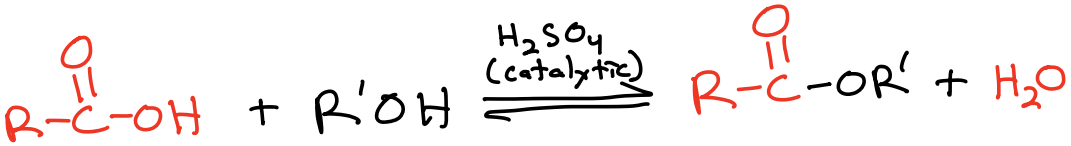
Microscopic Reversibilty: Acid Catalyzed Ester Hydrolysis-Fischer Esterification



Microscopic Reversibilty: Acid Catalyzed Ester Hydrolysis-Fischer Esterification

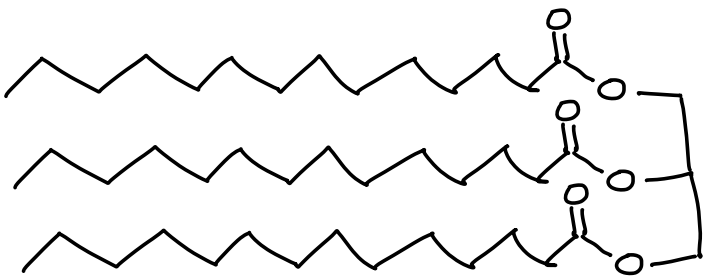


Microscopic Reversibility → The mechanism of a reversible process is the same (same intermediates) in both directions!



Transesterification

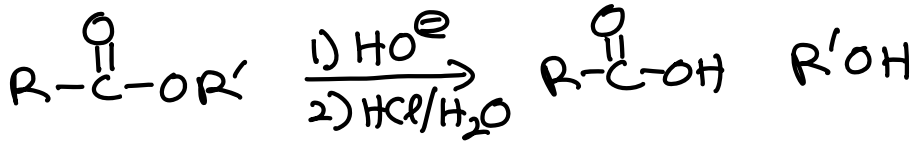
Note: These chains are not drawn accurately. There are different lengths and there are numerous cis C=C bonds in the alkyl chains that I did not draw.



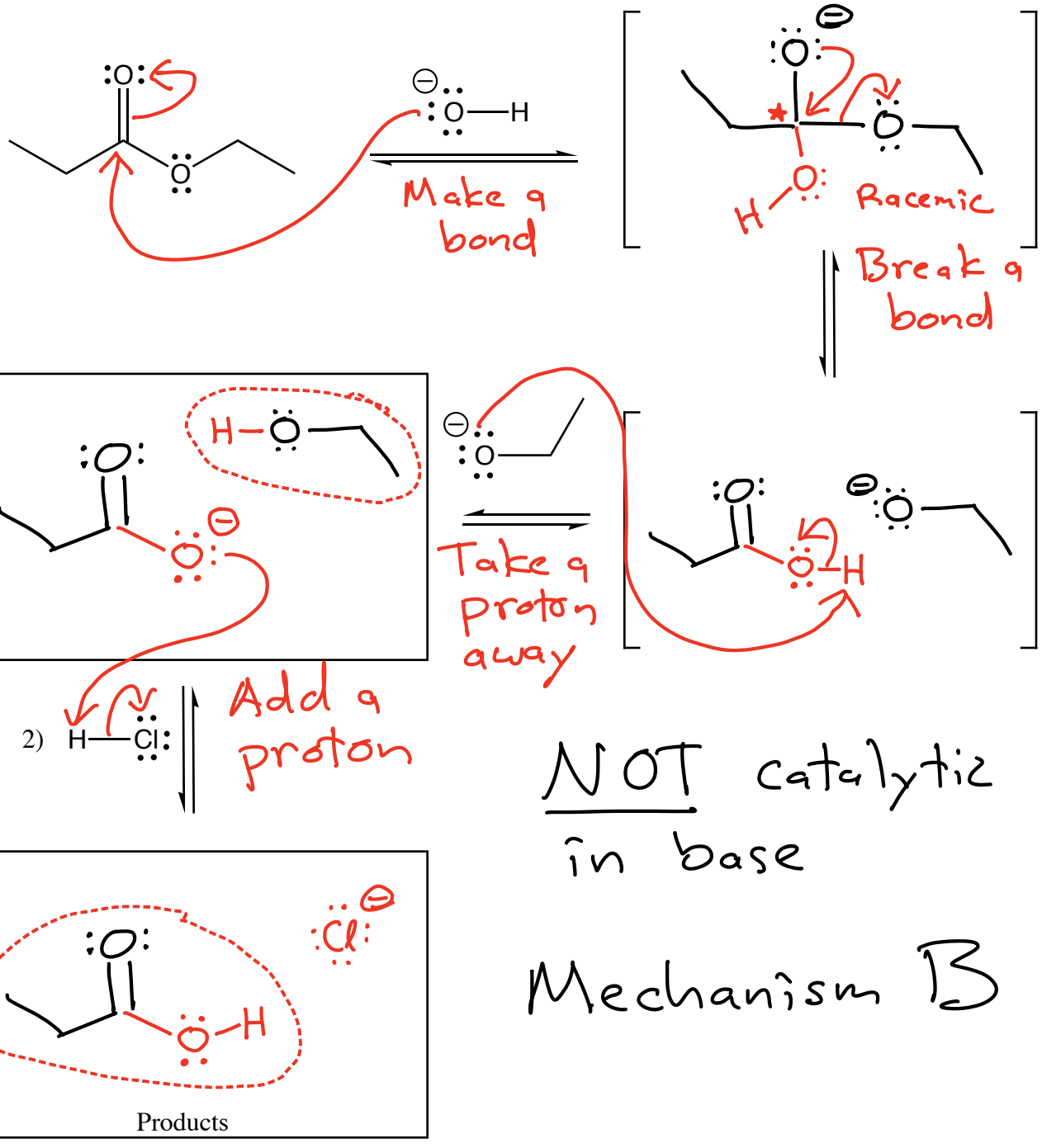
H_2SO_4 (catalytic)

CH_3OH

Biodiesel



Base-Promoted Ester Hydrolysis - Saponification



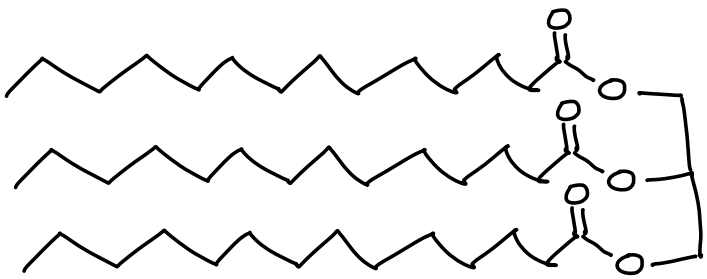
NOT catalytic in base

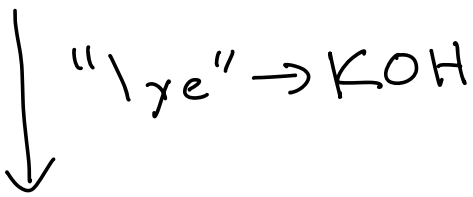
Mechanism B

Driving force → converts $HO^{\ominus}$ to $R-C(=O)-O^{\ominus}$

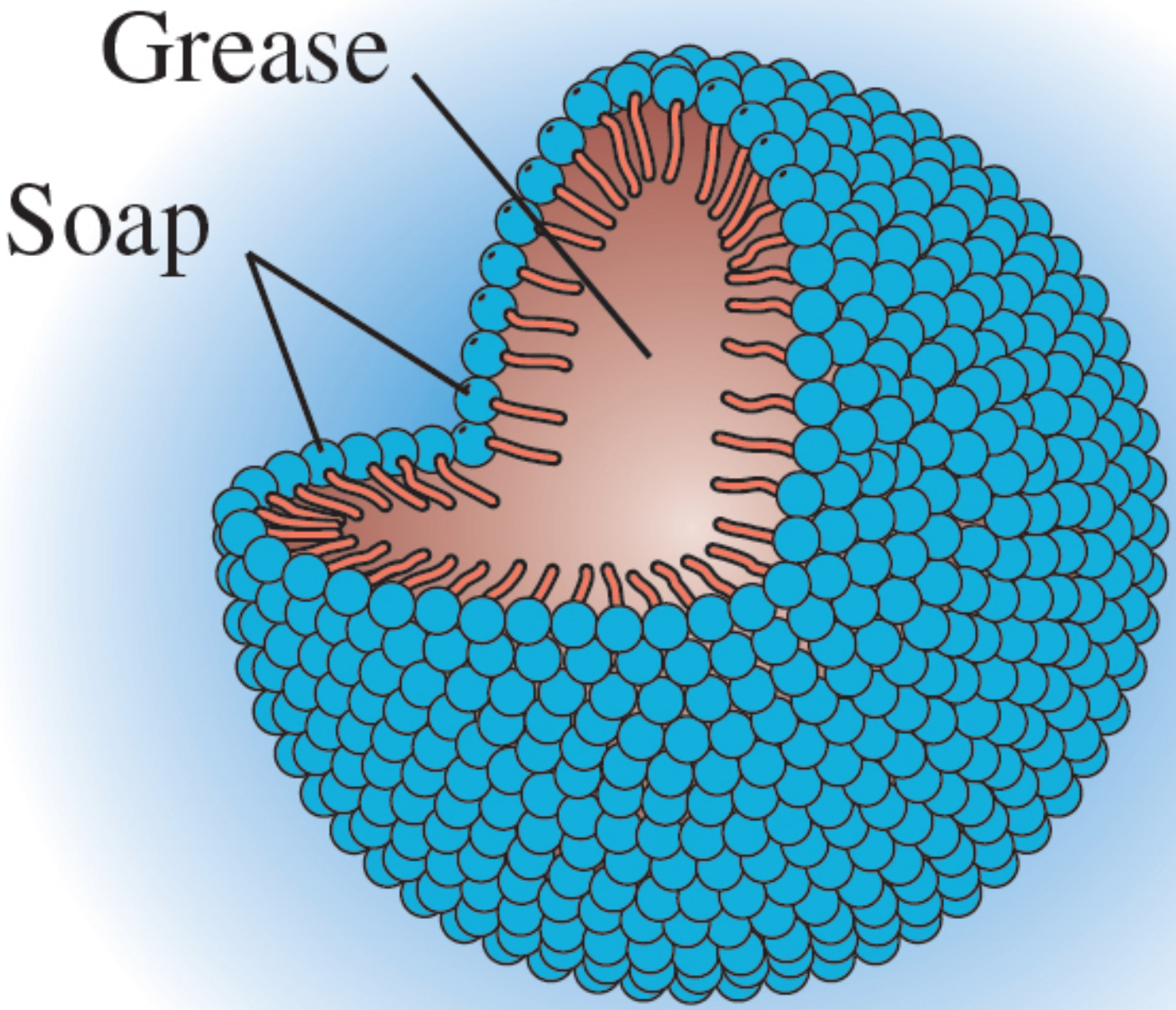
More stable anion → favored → MOTIVE

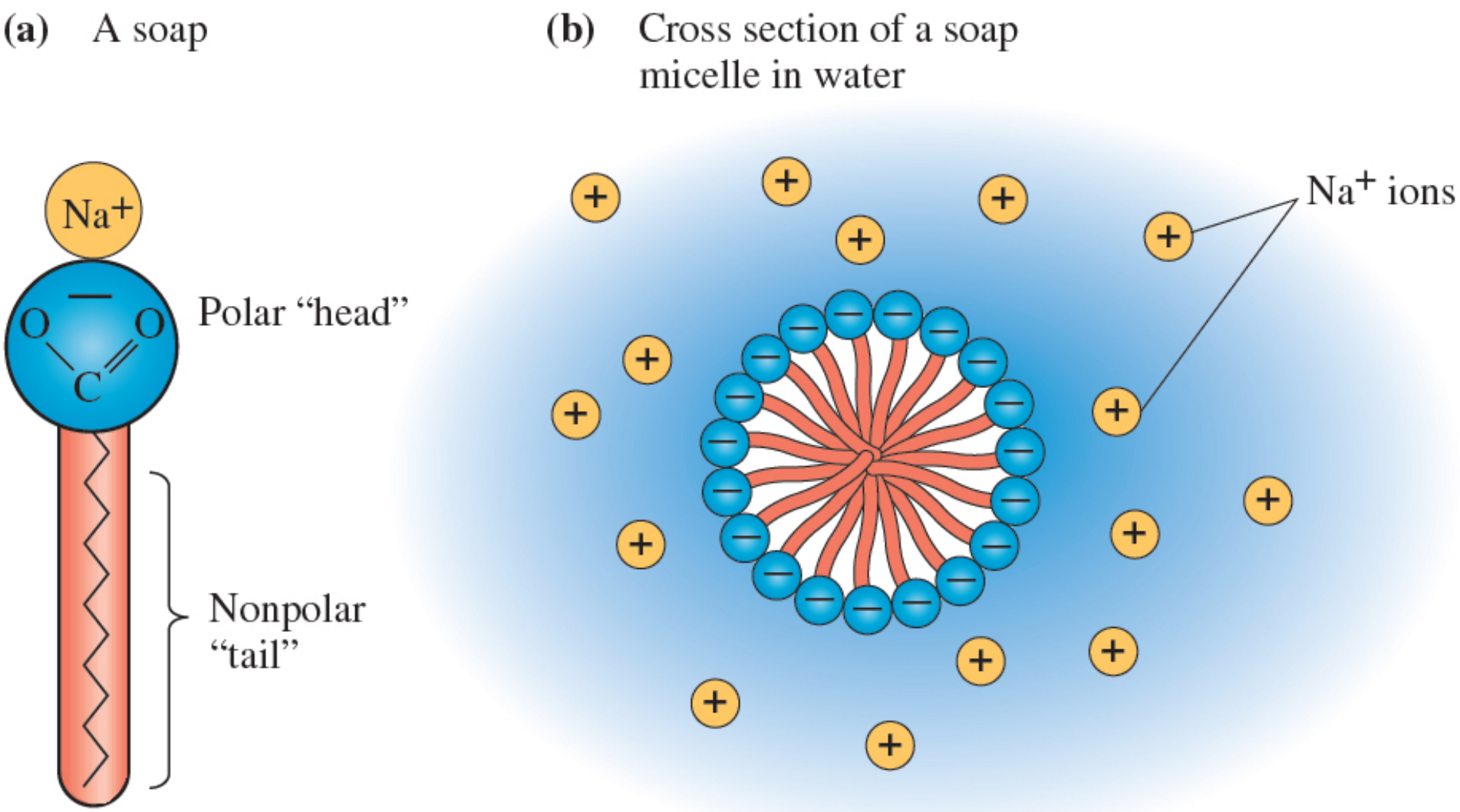
Note: These chains are not drawn accurately. There are different lengths and there are numerous cis C=C bonds in the alkyl chains that I did not draw.



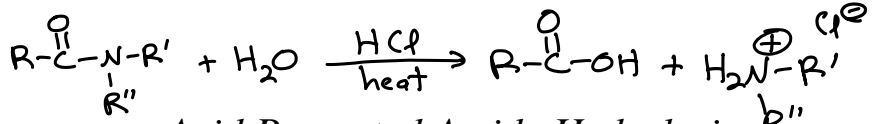


Soap micelle with "dissolved" grease




(a) A soap
Na+
O
O
C
Polar "head"
Nonpolar "tail"
(b) Cross section of a soap micelle in water
Na+ ions

Amides → they are so unreactive that they need strong acid and heat



Acid Promoted Amide Hydrolysis