(16) **Today**

6.1 Catalysis and How Enzymes Work

Next Class (17)

6.1 How Enzymes Work

6.2 Kinetics

6.3 Enzyme Kinetics

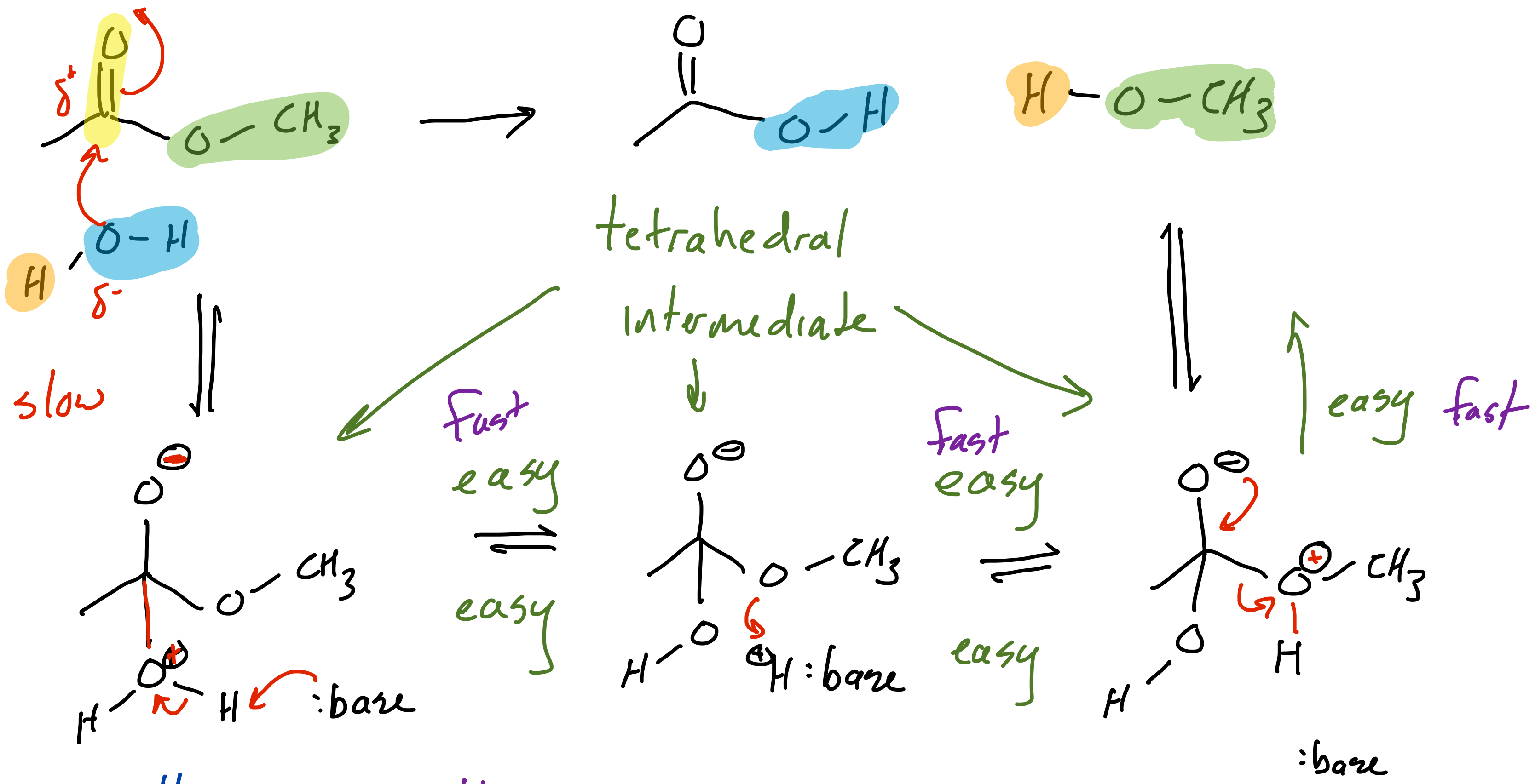
(18) **Second Class from Today**

6.3 Enzyme Kinetics

Third Class from Today (19)

We'll see

The Transition State in an acyl substitution reaction

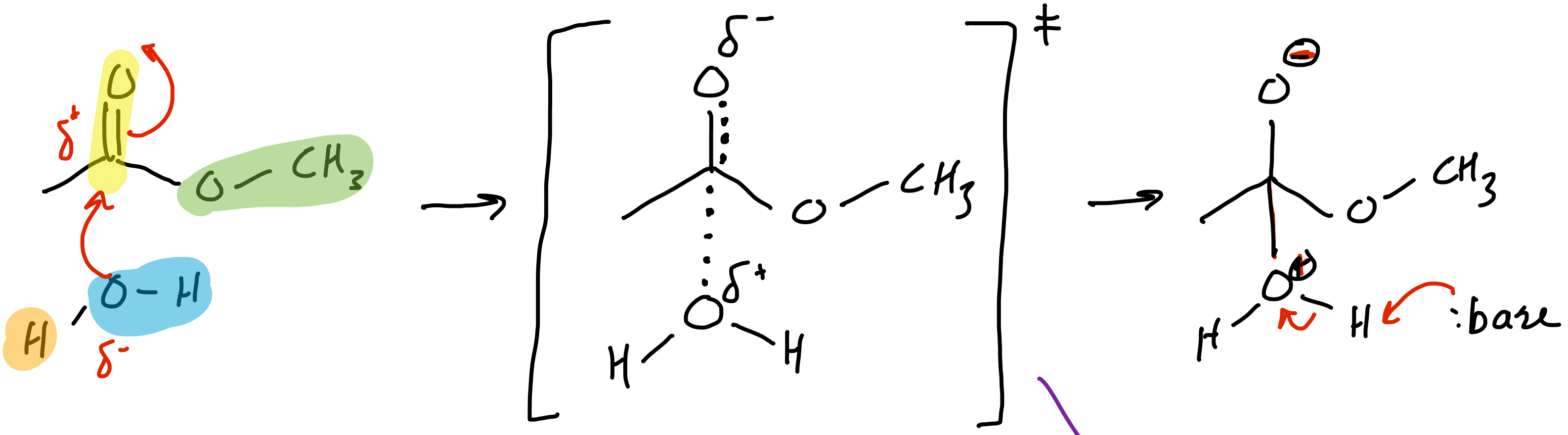


Zwitter ion
high energy
intermediate

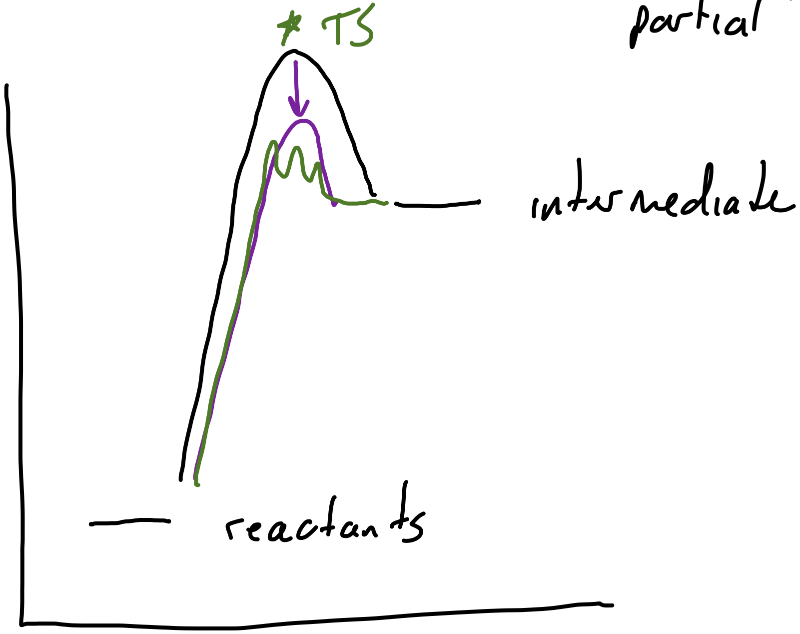
can't finish substitution because $^{\ominus}OCH_3$ is a bad LG

now the $HOCH_3$ can leave because it is a very weak base

The Transition State in an acyl substitution reaction



... represent partial bonds



to catalyze a reaction the energy of the transition state must be lowered...

stabilize it

change the path

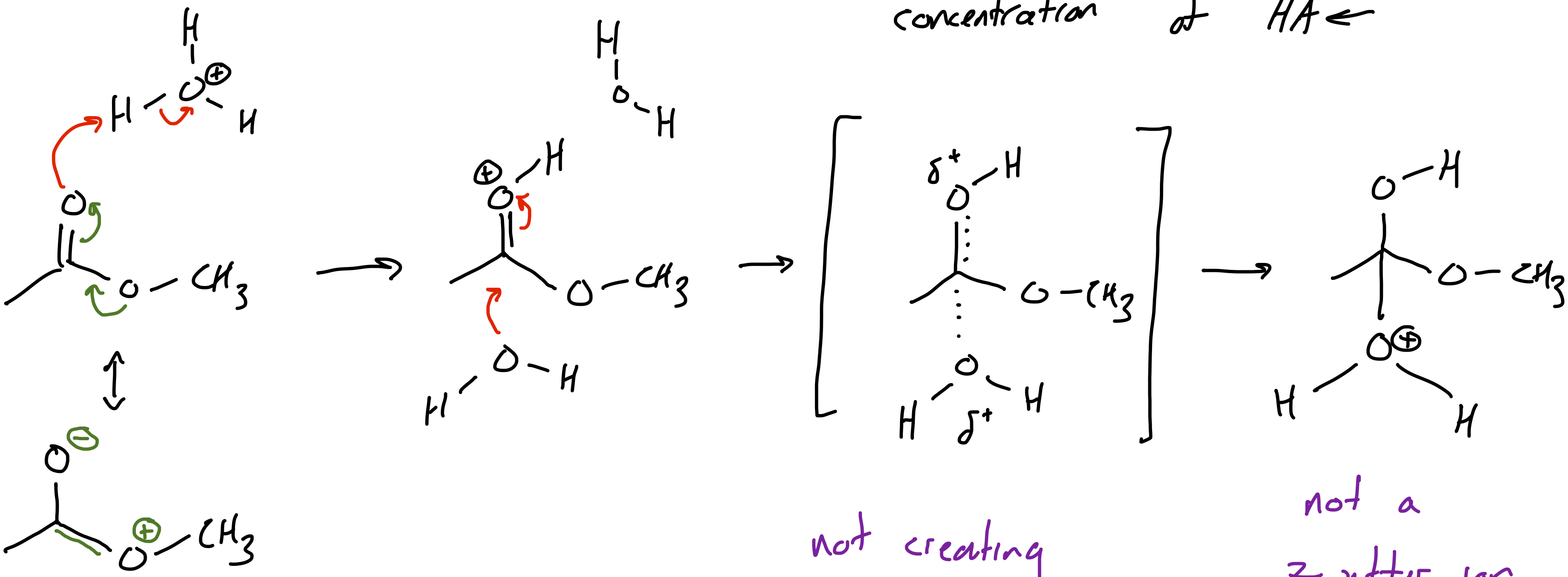
Catalytics Strategies: **Acid**-Base Catalysis

6.1.1.1

Specific vs General

rxn rate depends on $[H_3O^+]$

reaction rate depends on concentration of HA ←



e⁻ delocalization shows us that the C=O O is more e⁻ rich than the C–O–C O

not creating charge separation in our transition state

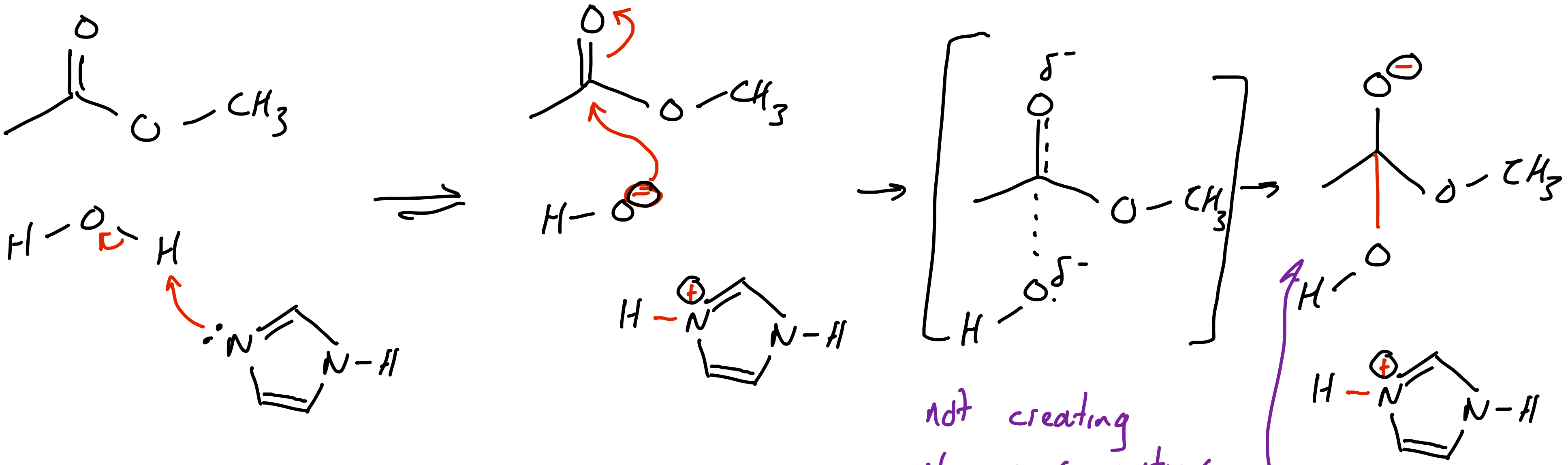
not a zwitter ion

tetrahedral intermediate

Catalytics Strategies: Acid-**Base** Catalysis

6.1.1.1

OH^- Specific vs General weak base



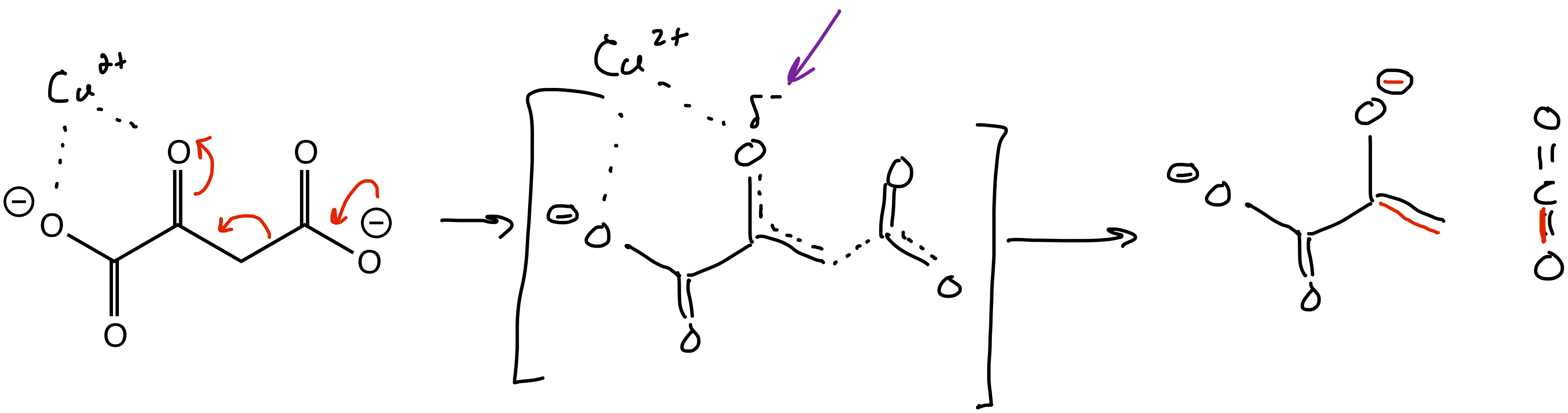
not creating charge separations so energy gap between reactant + TS is lower

intermediate is not zwitterionic

Electrostatic: Stabilizing Charge

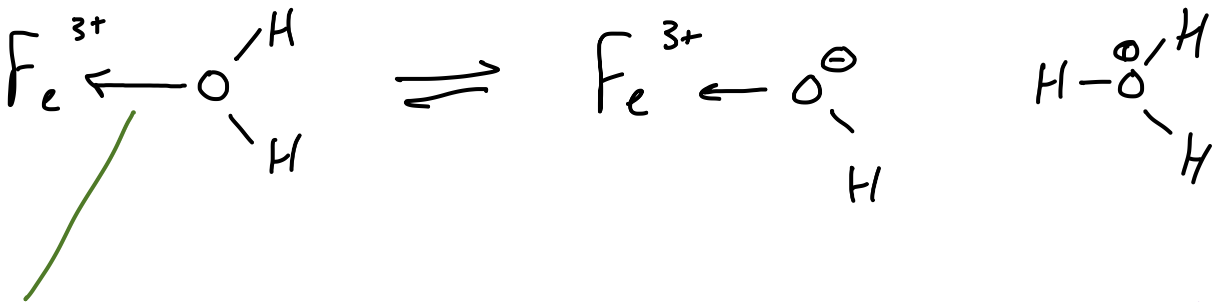
Stabilize charge that builds up in TS

positively charged metal ion stabilizes build up of charge on O atom



Electrostatic: Polarizing Water Molecules

+2 + +3 metal ions are Lewis acids

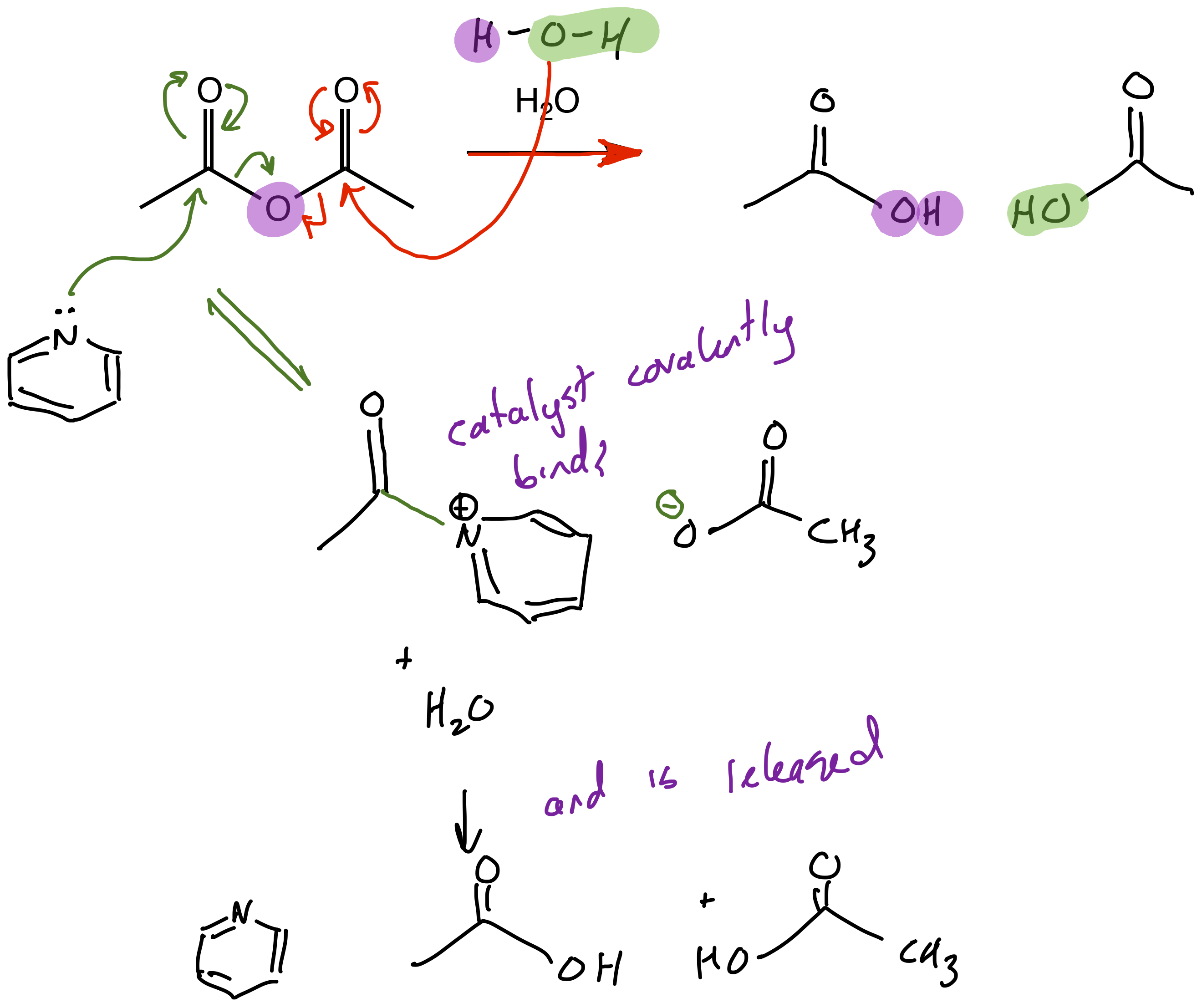


coordinate
covalent
bond

metals can make water
molecules more acidic ...
make H_2O a better proton donor

Covalent Catalysis

The catalyst covalently bonds to the reactant, speeds up one step of the rxn and is then released



catalyst covalently binds

and is released