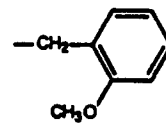
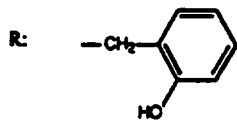
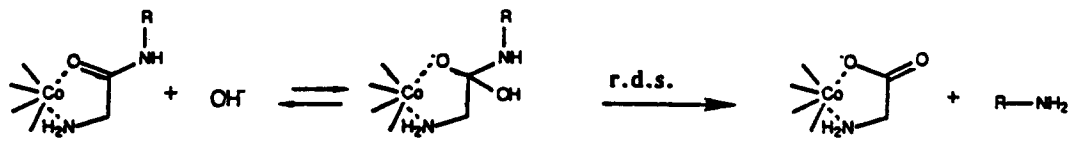
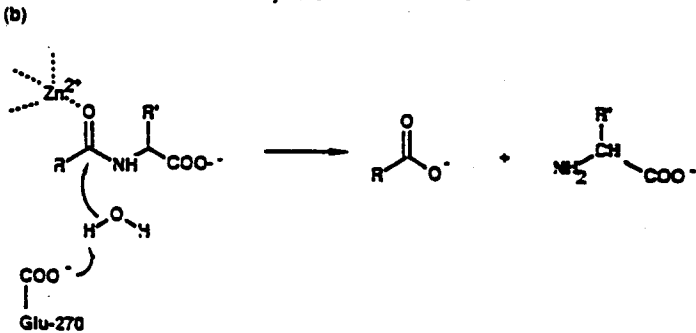
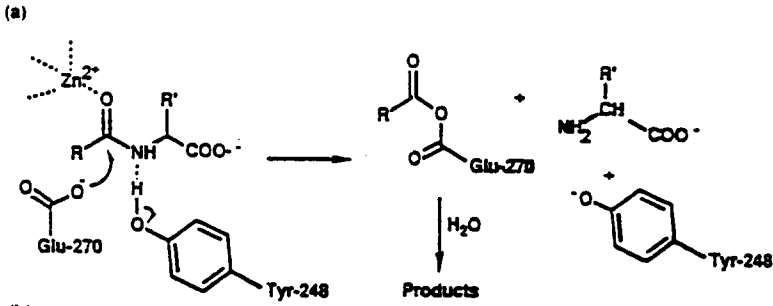
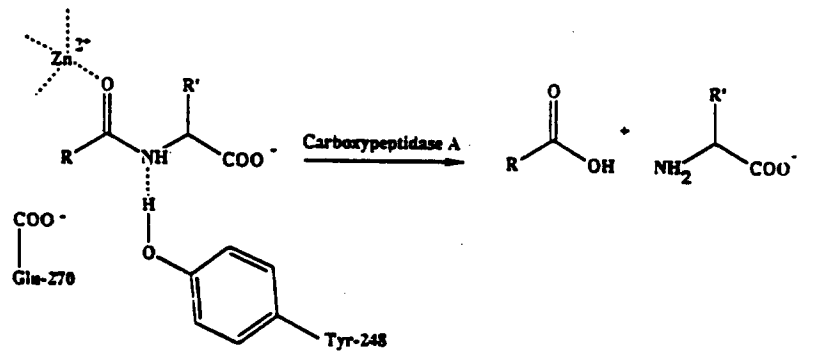
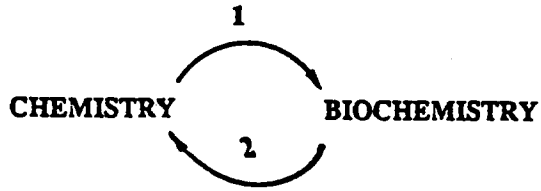


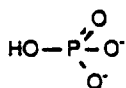
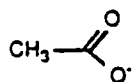
ENZYME MODELS

1. FURNISH RELEVANT CHEMISTRY TO HELP US UNDERSTAND ENZYMATIC REACTIONS.

2. INVENT NEW CHEMISTRY WITH INSPIRATION FROM WHAT IS KNOWN ABOUT ENZYMATIC REACTIONS.

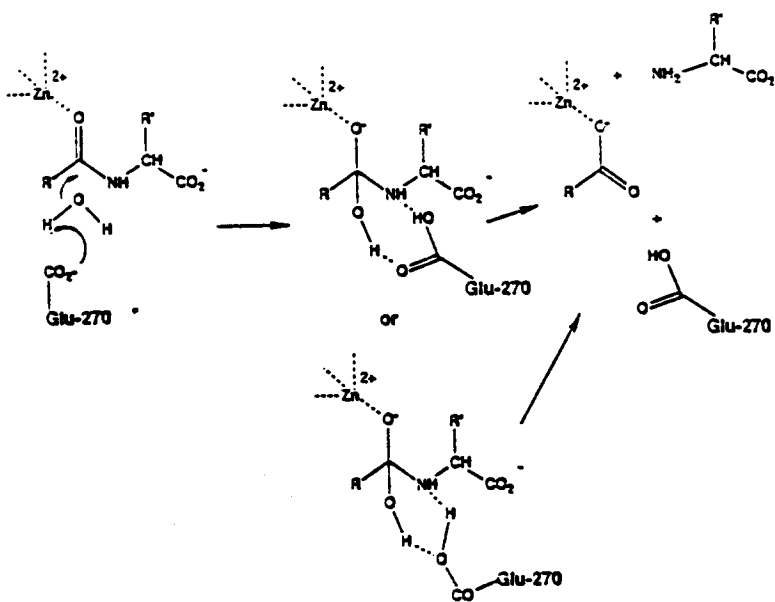
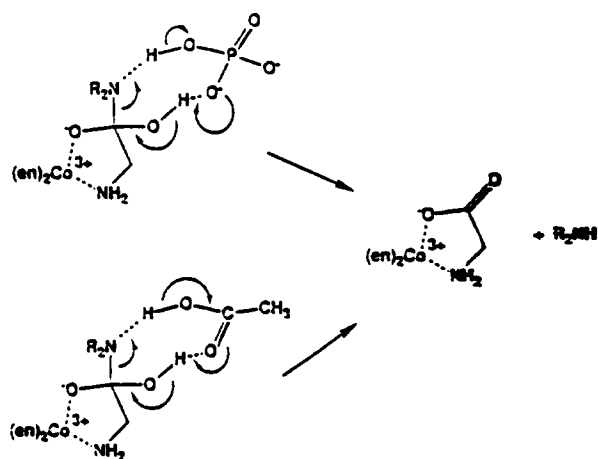
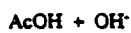
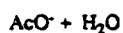
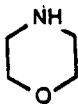
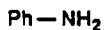


Buffer Catalysis

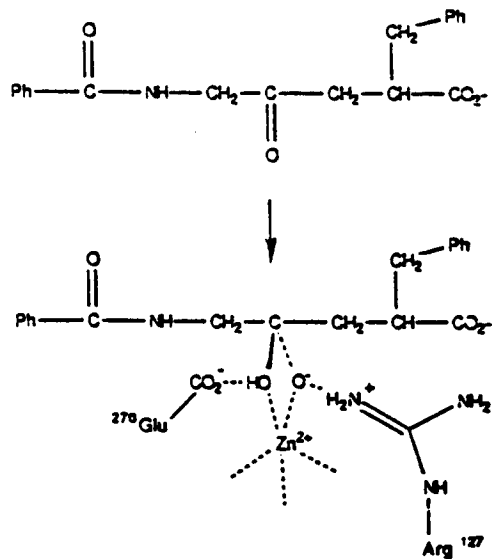


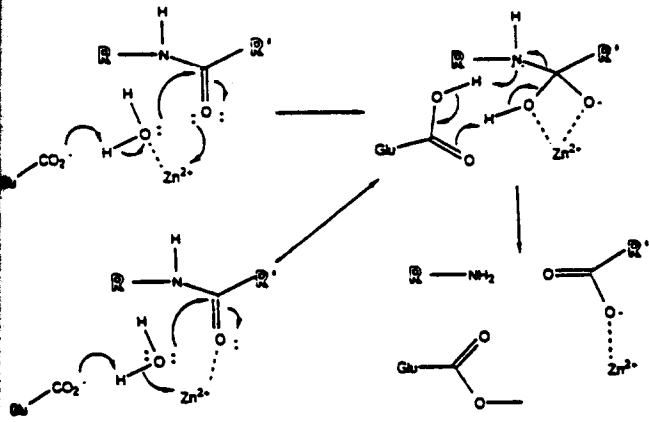
compete with PhOH group

no catalysis by

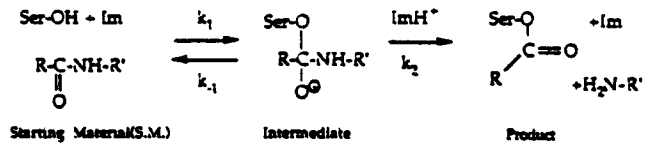
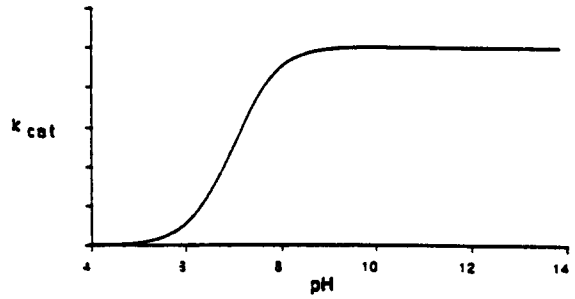


Christianson, David, and Lipscomb PNAS 1987:



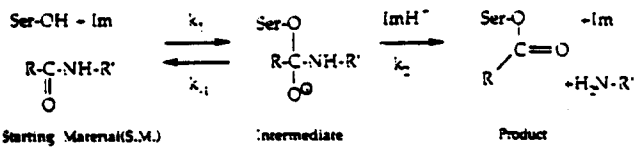


Chymotrypsin - 1



Why doesn't the titration of ImH⁺ at high pH lower the rate?

Chymotrypsin - 2

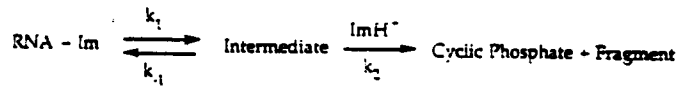


rate = rate of formation of intermediate X fraction of intermediate that goes on to product

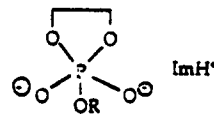
$$\begin{aligned}
 &= k_1 [\text{Im}] [\text{S.M.}] \times \frac{k_2 [\text{ImH}^+] [\text{Int}]}{k_{-1} [\text{ImH}^+] [\text{Int}] + k_2 [\text{ImH}^+] [\text{Int}]} \\
 &= k_1 [\text{Im}] [\text{S.M.}] \times \frac{k_2}{k_{-1} + k_2}
 \end{aligned}$$

Therefore the rate is not diminished at high pH, where [ImH⁺] is lower

RNA Cleavage by Imidazole Buffer - 1

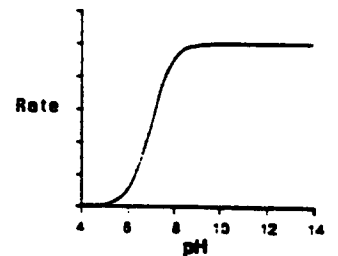


If Intermediate is

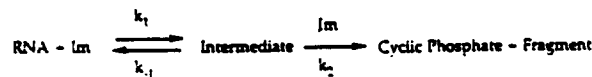


$$\text{Then rate} = k_1 [\text{RNA}] [\text{Im}] \frac{k_2}{k_2 + k_{-1}}$$

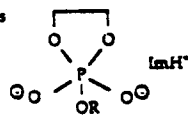
Therefore



RNA Cleavage by Imidazole Buffer - 2



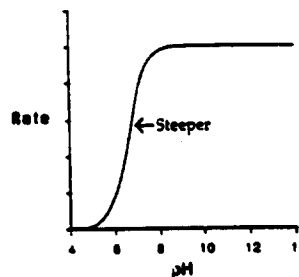
If Intermediate is



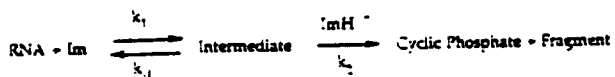
And if the second step is catalyzed by Im

$$\text{rate} = k_1 [\text{RNA}] [\text{Im}] \frac{k_2 [\text{Im}] [\text{Int}]}{k_2 [\text{Im}] [\text{Int}] + k_{-1} [\text{ImH}^+] [\text{Int}]}$$

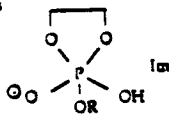
Therefore ImH⁺ is an inhibitor



RNA Cleavage by Imidazole Buffer - 3

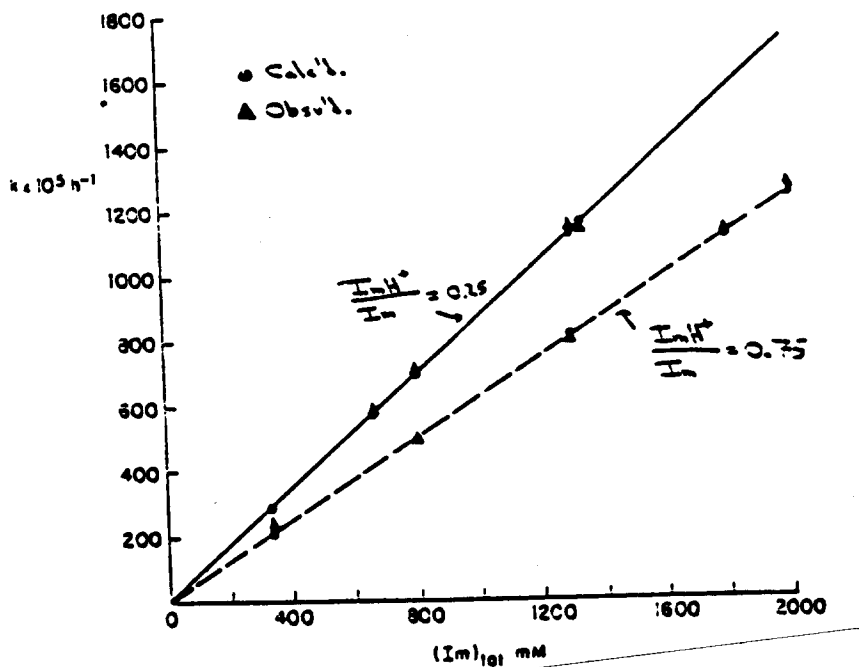
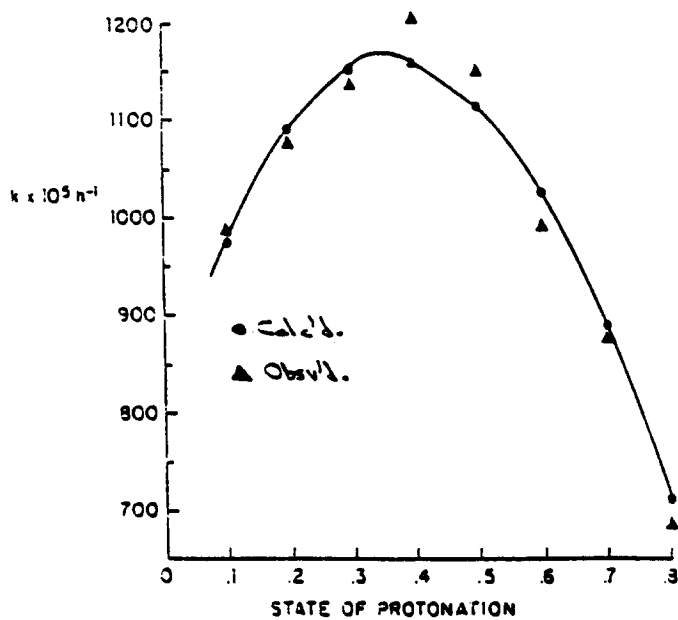
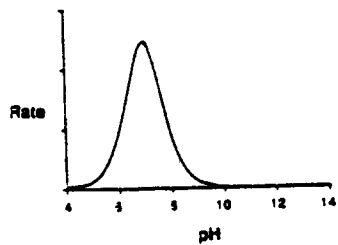


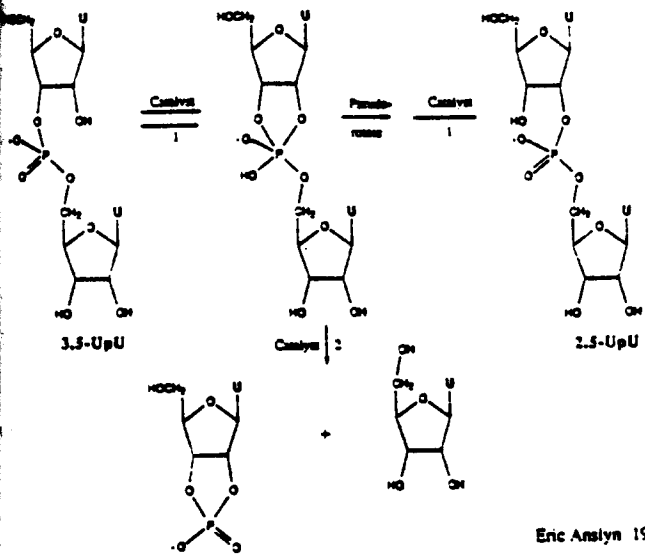
If Intermediate is



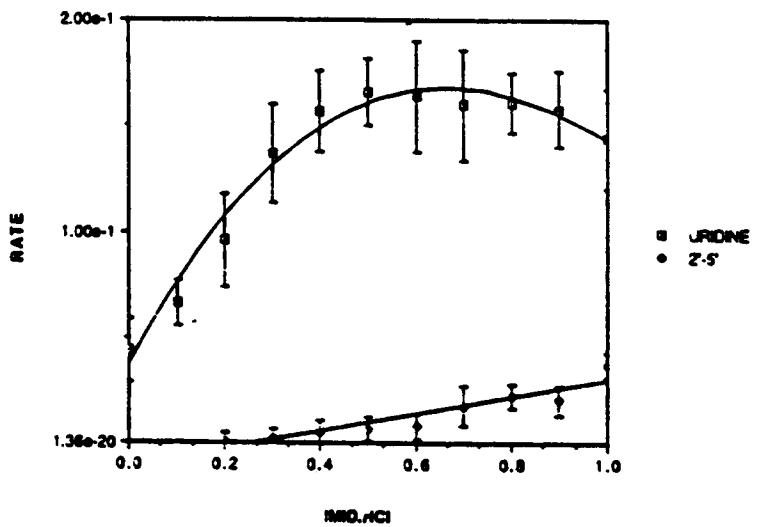
$$\text{rate} = k_1[\text{RNA}][\text{Im}] \frac{k_2[\text{ImH}^+][\text{Int}]}{k_2[\text{ImH}^+][\text{Int}] + k_{-1}[\text{Im}][\text{Int}]}$$

Therefore

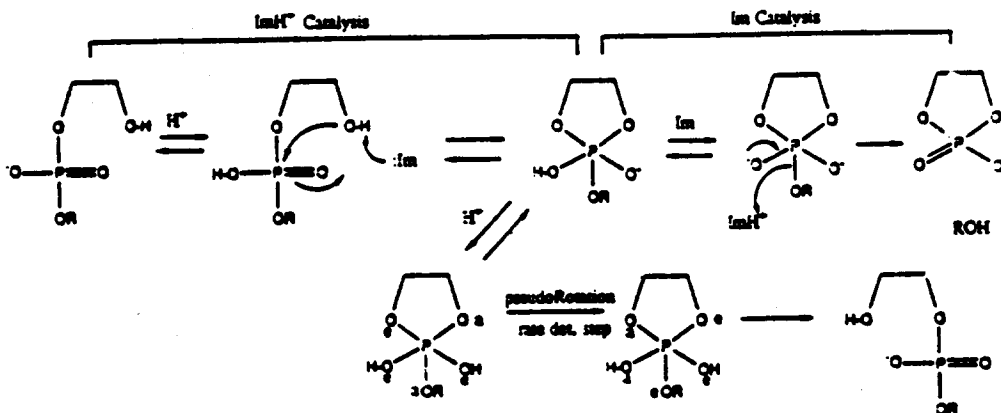




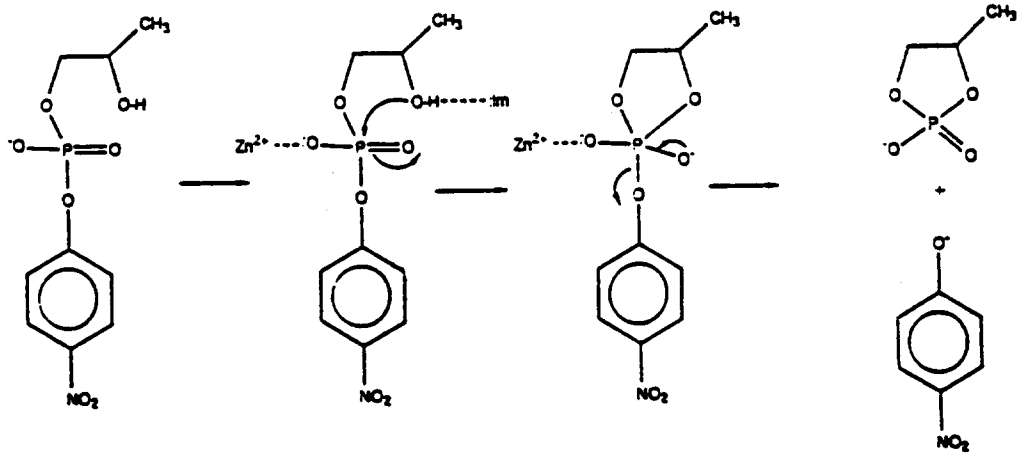
CORRECTED BELL CURVE



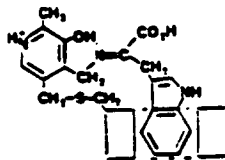
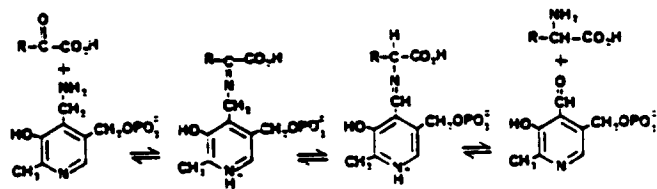
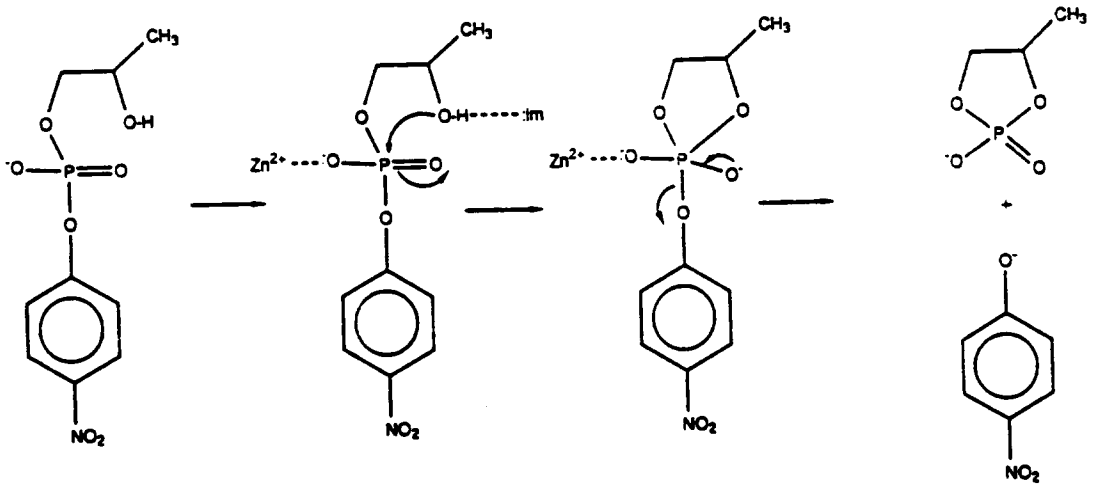
Mechanism for Imidazole-Catalyzed RNA Cleavage and Isomerization



Zn²⁺ and Imidazole Catalyzed Cleavage



Zn²⁺ and Imidazole Catalyzed Cleavage



1, bound to indolepyruvic acid

