The reciprocal form of the rate equation is again an equation of a straight line with a slope of $(1+[I]/K_I)K_{M/}V_{max}$.

The equations for the intercepts can obtained by setting 1/[S] and 1/v = 0.

If 1/[S] = 0, $1/v = (1+[I]/K_I)/V_{max}$.

If 1/v = 0, $1/[S] = -1/K_M$.

The plots in the presence and absence of inhibitor would be as follows

K_I can be determined from the 1/v intercept in the presence of inhibitor and the 1/v intercept ($1/V_{max}$) in the absence of inhibitor.

Heavy metals ions such as Pb^{2+}, Ag^{+} and Hg^{2+} are common non-competitive inhibitors of many enzymes.

These metals ions form strong complexes with neutral and anionic ligand groups of amino acid side chains thought to be important to enzyme catalysis including the imidazole of his and the thiolate of cys

Consider the role of such groups in converting a bound substrate into products.

As noted earlier chymotrypsin is a digestive enzyme found in the small intestine that catalyzes the hydrolysis of peptide bonds in proteins.

His 57 has been shown to be part of a catalytic triad of amino acid residues in chymotrypsin which generates an oxygen nucleophile that initiates the hydrolysis as shown in Figs 9-33 and 9-34.

Ser 195, his 57 and asp 102 are positioned so that the imidazole group of his can accept the proton from the alcohol group of ser and be stabilized by the negatively charged carboxylate group of asp.

Fig 9-37 shows how the oxygen atom of the hydroxyl group of ser 195 acts as a nucleophile in attacking the carbonyl carbon of the peptide bond of the substrate leading to the formation of an acyl enzyme intermediate.

Fig 9-38 shows how the imidazole group of his 57 subsequently accepts a proton from H_2O to generate a hydroxide nucleophile leading to the hydrolysis of the acyl enzyme to complete the reaction.

The triad of amino acids and the H-bonding groups (Fig 9-36) have the effect of lowering the activation energy for the reaction, relative to the reaction in the absence of enzyme, by stabilizing the transition states for the acylation and deacylation steps.

Chymotrypsin is one of a number of serine proteases including trypsin and elastase that have such a catalytic triad.

The thiol group of cys functions in a manner similar to ser in thiol proteases such as papain shown in Fig 9-41.

It should be apparent that binding of a metal ion to the imidazole of His 57 in chymotrypsin, or the thiolate of cys in papain, should inhibit the reaction.