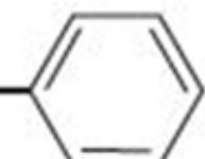▸ $\dfrac{k_{cat}}{K_M}$ = number we can use to compare enzyme effectiveness with different substrates

▸ Chymotrypsin , which has many different substrates , and is responsible for cleaving peptide bonds , is said to prefer hydrophobic residues based on its efficiency calculations

TABLE 8.6 Preferences of chymotrypsin in the hydrolysis of several *N*-acetyl amino acid methyl esters, as measured by k_{cat}/K_M

Amino Acid in Ester	Amino Acid Side Chain	k_{cat}/K_M [(mol/L)$^{-1}$s^{-1}]
Glycine	—H	1.3×10^{-1}
Norvaline	—CH$_2$CH$_2$CH$_3$	3.6×10^2
Norleucine	—CH$_2$CH$_2$CH$_2$CH$_3$	3.0×10^3
Phenylalanine	—CH$_2$— (phenyl)	1.0×10^5

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▸ Most Efficient = Phenylalanine

▸ Mutations in the amino acid sequence of an enzyme will affect its K_M and k_{cat}

▸ In general :

   ▸ Changes that only affect k_{cat} affect only transition state stabilization

   ▸ Changes that only affect K_M are involved in initial substrate binding

▸ k_{cat} = speed

▸ K_M = how little of the substrate that is required in order for the substrate to do its job

▸ Many mutations affect both K_M and k_{cat} indicating an amino acid side chain involved in both initial substrate binding and its stabilization upon the proteins conformational change.