One Page of Enzymology
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I am asking you to learn the equations on page 437 of Garrett and Grisham. If you understand them properly, you should be able to work the exam questions appended to this page. I am not deriving anything and will not ask you about the derivation.

Michaelis-Menten enzymes represent the simplest case of an enzyme with a single active site and a single substrate. The substrate is present or absent. The more ES (enzyme substrate complex) is present, the faster product will be produced. That is to say

\[ v = k_2 [ES] \] (page 436)

and thus it follows that \( V_{\text{max}} = k_2 [E] \); In this context the \( k_2 \) is called the "turnover number" – its dimensions are "per second," and it expresses how many molecules of product one active site can produce in one second. Table 14.4 (439) shows that the turnover number (sometimes called \( k_{\text{cat}} \)) can vary from 0.5 to 40,000,000 per second.

The two numbers which allow you to draw the complete graph of rate versus substrate concentration (V versus S) for a Michaelis Menten enzyme are \( V_{\text{max}} \) and \( K_m \). \( V_{\text{max}} \) is not a constant (it varies with enzyme concentration) but \( K_m \), the Michaelis Constant, is. The units of \( K_m \) are moles per liter, and it can thus be added, subtracted, or equated with \([S]\). \( K_m \) gives a rough indication of binding strength between enzyme and substrate (except in rare cases with very high turnover number). Table 14.3 shows \( K_m \) varying from 122 to 0.0004 mM.

Learn the Michaelis Menten Equation in the form of (14.23):

\[ v = V_{\text{max}} ([S]/([S] + K_m)) \]

We will not cover competitive or noncompetitive inhibition – you should learn those on your own. You should understand the discussion of the zero order and first order part of the hyperbolic V vs S curve. Here are some test questions:

An enzyme is found to have a \( V_{\text{max}} \), at a certain concentration, of 100 mM per second. The enzyme has a \( K_m \) with its substrate of 2 mM. Calculate the initial rate when substrate is present at 8 mM concentration. Show work and circle answer.

Draw the curve that would be observed for a Michaelis Menten enzyme, using both standard V vs S axes and a double reciprocal plot (1/V vs 1/S). On each graph indicate how the \( V_{\text{max}} \) and the \( K_m \) would be found.

If you feed a subject alcohol and watch it disappear from the blood, it disappears at a constant rate. But if you give a subject aspirin and watch that disappear, it has a half life of disappearance, and the rate changes constantly. How does this relate to the assigned reading on page 437? Assume that both ethanol and aspirin are metabolized by Michaelis-Menten enzymes.