

Kinetics Self-Assessment Homework

This homework is to allow you to work through some quantitative problems on topics where learning the concepts is not often easy. Please try these problems and check your answers when the answers are posted.

1. An enzyme has K_m of 10 mM and V_{max} of 100 mmol/min.

a. If $[S]$ is 100 mM, which will increase the velocity more: a 10-fold decrease in K_m or a 10-fold increase in V_{max} ? Explain why with specific examples.

b. If $[S]$ is 10 mM, which will increase the velocity more: a 10-fold decrease in K_m or a 10-fold increase in V_{max} ? Explain why with specific examples.

2. Salicylate (aspirin) is known to inhibit glutamate dehydrogenase, an enzyme that catalyzes the oxidative removal of the amino group from glutamate to generate 2-oxoglutarate. Below are data from a glutamate dehydrogenase reaction, in the presence or absence of 40 mM salicylate.

	Product per minute (microgm)	
Substrate (mM)	No inhibitor	+ 40 mM salicylate
1.5	0.21	0.08
2.0	0.25	0.10
3.0	0.28	0.12
4.0	0.33	0.13
8.0	0.44	0.16
16.0	0.40	0.18

a. Plot the data in two ways: v vs. $[S]$ and $1/v$ vs $1/[S]$.

b. Use these two types of plots (or curve fitting if you prefer) to estimate V_{max} and K_m in the presence and absence of salicylate. How well do the estimates from the types of plots agree?

c. What type of inhibitor is salicylate?

3. True or False. If false, correct the statement to make it true.

a. When an enzyme assay is run with a substrate concentration far above the reaction's K_m , the rate of the reaction will be equal to the reaction's V_{max} .

b. A competitive inhibitor has no effect on the apparent K_m of a reaction, but instead decreases V_{max} .