Bioengineering 304: Physiology

October 22, 2010
Homework Assignment #3
Due: 29th Oct 2010 Midnight

Points awarded for each question are indicated in square brackets. Return assignment with your name clearly indicated at the top of your answer sheet. Give full workings.

[10] **Question 1.** What do we mean by the accuracy and precision of a measurement?

[10] **Question 2.** Describe the two measures that tell us the accuracy and precision in a set of measurements?

[25] **Question 3. Error Propagation** Given the equation, $y = 1/x$, if there is an error, s_x in x, what is the corresponding error in y? Plot a chart of 1/x on the x axis where the height of each bar is given by the error in y. You can assume that the error in x, $s_x = 1$. Comment on your result and relate it to the Lineweaver-Burk plot.

[35] **Question 4.**

a) Write down the simple irreversible Michaelis-Menten equation.

b) Assume that the Km and Vmax for an enzyme is known exactly, however the concentration of substrate, S, includes an error, , derive the equation that will give the corresponding error in the reaction rate, v.

c) The Km for an enzyme is known to be 5 mM and Vmax 10 moles/sec. If the substrate concentration is what is the value for the reaction rate and the corresponding error?

[30] Question 5. The following data shows the reaction velocity for an enzyme at different substrate concentrations.

a) Using the Lineweaver-Burk and Hanes plots, estimate the Km and Vmax. Points will be awarded for clear graphing style.

b) Using the same data, estimate the Km and Vmax using a nonlinear fitting method. Pick a tool of your choice for carrying out this calculation.

Substrate(mM)	Reaction Velocity (mole/sec)
5	0.055
6	0.09
8	0.107
24	0.24
45	0.44
100	0.56