Name _____

ABE 580
Exam 2
(Closed Book, Closed Notes)
Friday, March 3, 2006
200 Points

1. Metabolism

    a. Briefly define anabolism (10 points).

    b. Briefly define catabolism (10 points):

    c. Briefly define metabolism in terms of anabolism, catabolism, and the relationship between them (10 points):

    d. Which of the following is **not** a cofactor, intermediate, or metabolite in glycolysis (10 points):

        _____ ATP

        _____ Fructose-6-phosphate

        _____ Pyruvate

        _____ FAD+

e. Which of the following is **not** a cofactor, intermediate, or metabolite in the TCA cycle (10 points):

_____ GDP

_____ PEP

_____ Glyceraldehyde-3-phosphate

_____ Oxaloacetate

f. True or false (10 points):

_____ ATP is the main carrier of Gibb's free energy between chemical reactions in the cell

_____ NADH is used by cells to oxidize compounds

_____ Redox potential is converted to Gibb's free energy by oxidative enolization

_____ Glycolysis can only occur when oxygen is present

_____ Only reactions that have a Gibb's free energy < 0 will occur spontaneously (without the addition of energy)

g. Enzymes are (10 points):

_____ polyamides

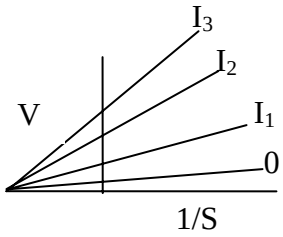
_____ polypeptides

_____ polysaccharides

_____ polynucleotides

2. Enzymes.

Below each plot, check all that apply



a) (15 points)

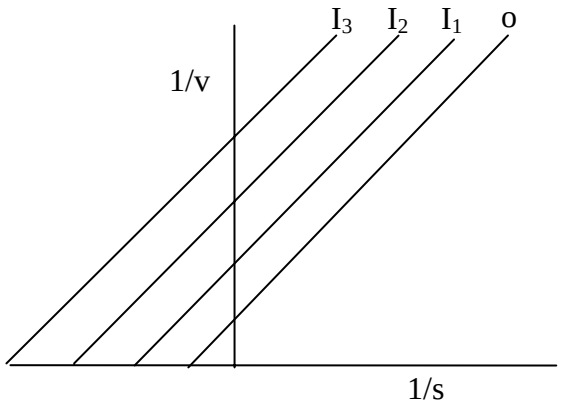
_____ competitively inhibited

_____ $v = \frac{v_{max}\, E_T\, [S]}{K_m + [S]}$

_____ noncompetitively inhibited

_____ $v = \frac{V_{max}[S]}{K_m + \left(1 + \frac{I}{K_I}\right)[S]}$

_____ $v = \frac{V_{max}[S]}{K_m\left(1 + \frac{I}{K_I}\right) + [S]}$



b) (15 points)

_____ competitively inhibited

_____ $v = \frac{v_{max}\, E_T\, [S]}{K_m + [S]}$

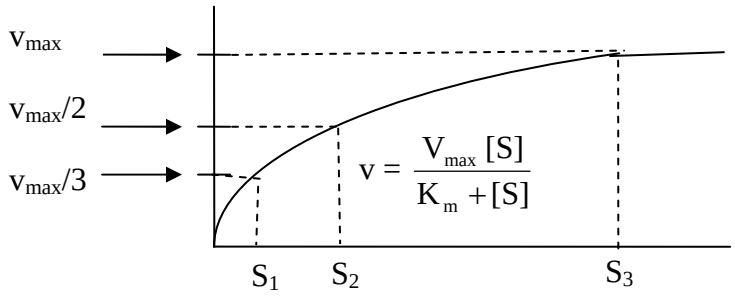
_____ noncompetitively inhibited

_____ $v = \frac{V_{max}[S]}{K_m + \left(1 + \frac{I}{K_I}\right)[S]}$

_____ $v = \frac{V_{max}[S]}{K_m\left(1 + \frac{I}{K_I}\right) + [S]}$

3. Enzyme Kinetics

a.



Identify the substrate concentration that corresponds to K_m. Show your work, and check one answer (10 points):

_____ S_1

_____ S_2

_____ S_3

b. Check all that apply. The kinetic expression above suggests that the enzymatic reaction is (10 points):

_____ competitively inhibited

_____ reversible

_____ irreversible

_____ noncompetitively inhibited

c. Sketch below a “re-plotting” of this data from the figure in part a. so that the key kinetic parameters can be determined. Label the sketch to illustrate how these constants are obtained. (20 points)

4. Enzyme Kinetics

a. Below are the possible reaction sequences for an enzyme. Sketch below an Euler map of this enzyme reaction so that the King-Altman method may be applied to derived a kinetic expression (15 points).

1) $E + S \underset{k-1}{\overset{k1}{\rightleftharpoons}} ES \xrightarrow{k2} E + P$

2) $E + I \underset{k-3}{\overset{k3}{\rightleftharpoons}} EI$

3) $EI + S \underset{k-4}{\overset{k4}{\rightleftharpoons}} EIS \underset{k-5}{\overset{k5}{\rightleftharpoons}} ES + I$

b. Check all that apply. The reaction above is (15 points):

_____ competitively inhibited

_____ reversible

_____ irreversible

_____ noncompetitively inhibited

c. Sketch the possible paths for the enzyme reaction from the Euler map in part a. (15 points).

d. Using the information provided and your Euler paths, derive the kinetic expression for the <u>numerator</u> for the ratio:

$\frac{ES}{E_T}$, where $E_T = E + ES + EI + ESI$ (15 points).