**B1) What is an enzyme? What does enzyme kinetics mean?**

**B2) What is the active site in an enzyme? Sketch an enzyme and label the active site.**

**B3) Describe your understanding of how a substrate binds an enzyme. Hints: consider what physical and chemical characteristics of the substrate and the enzyme active site affect the binding strength and the amount of time the substrate is bound to the enzyme.**

**B4) How do you think temperature affects enzyme activity and can you explain the mechanism underlying this effect? How do you think pH affects enzyme activity, and what is a reasonable explanation of the mechanism underlying this effect?**

**Optional Thought Question:** Humans and other mammals have relatively constant body temperatures, but algae and plants (and most fish, amphibians, and reptiles) live at the temperature of their environment. If enzymes have an optimum temperature, how do you think these organisms live where there are large changes in temperature seasonally or even daily?

**M1) What does it mean for a curve/plot to be linear, and what does it mean for it to be non-linear? Sketch an example of a linear plot and a non-linear curve.**

**M2) The slope of a curve is equal to the change in the Y variable divided by the change in the X variable, thus slope = (y1- y2)/(x1 - x2). For the curve shown in the figure below, what can you say about the slope - the change in y relative to the change in x - in the region of the plot indicated by the blue box? What about the slope for the region of the plot indicated by the red box?**

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**M3) For the curve above, what is the value of x when y is at half its maximal value?**

**M4) Write a definition for an asymptote of a curve on a graph.**

**Practice Graphing Problems**

For each of the following sets of data, create a scatter plot and choose a trendline that gives the best fit. See next page for details on using excel.

**M5) Practice Problem 1 Data**

Graph the following data collected for growth of a bacterial culture over time.

|  |  |
| --- | --- |
| time (minutes) | bacteria (cells/mL) |
| 30 | 10 |
| 55 | 18 |
| 92 | 45 |
| 115 | 88 |
| 140 | 158 |
| 190 | 350 |
| 221 | 650 |

**M6) Practice Problem 2 Data**

Graph the following data set collected to test how wind speed affects temperature feel.

|  |  |
| --- | --- |
| wind speed (mph) | temp feel (°F) |
| 0 | 40 |
| 5 | 38 |
| 10 | 36 |
| 15 | 34 |
| 20 | 31 |
| 25 | 30 |
| 30 | 28 |
| 35 | 26 |

**Supplement: How to create a scatter plot with a trendline in Excel.**

1. Enter your data in columns. Highlight the data and column titles, and then select Insert>Charts>Scatter:

 

2. Click on the first type of Scatter Chart (also called scatter plot):



3. Click on the chart itself. You will then see a menu on the top to Add Element. Go down to Trendline, and select “More Trendline Options” You can then add different types of trendlines:

 

4. You can also add a trendline equation, and an R-squared value:



The closer the R-squared value is to +1 or -1, the stronger the line’s fit is to the data. You may need to try different types of equations (Linear, Power) to find the best fit. Under Polynomial Equations, Order 2 means quadratic, Order 3 means cubic.

 