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Activity Overview

A.
Title: Enzyme Kinetics, Part Two
Possible Subject Area: Biochemistry, Cell Biology
Main Quantitative Skills:
- Reading, interpreting, and creating graphs
- Solving equations, algebraic manipulations
- Linear transformation, regression lines
- Creating formulas in Excel

B.
Overview: This activity is a self contained guided inquiry activity on the Lineweaver Burk transformation of enzymatic data. This activity can be used as a stand alone activity for students already familiar with the Michaelis Menton model of enzyme kinetics, or it can be used immediately following the activity on enzyme kinetics where the Michaelis Menton model is introduced. The double reciprocal linear transformation is introduced, then, using Excel, students take the appropriate reciprocals and graph \( 1/v \) vs. \( 1/[S] \). Through a series of questions, students learn how to determine \( K_m \) and \( V_{max} \) from the linear graph.

At the completion of this activity, students will be able to:
- Linearize the equation of a hyperbola
- Determine \( K_m \) and \( V_{max} \) from the double reciprocal transformation of enzymatic rate data

C. Activity and answers

D.
Notes to instructors: This activity requires that students have access to computers with Excel. Students could work alone or in a group of 2 to complete this activity. It should take approximately 30 - 50 to complete the activity, depending on the students’ comfort with and prior exposure to Excel. It is designed to introduce the Lineweaver Burk double reciprocal transformation of enzymatic rate data to upper level (junior/senior) science majors who have taken courses in Principles of Chemistry (through kinetics) and an introductory cell biology course. Students should already be familiar with the Michaelis Menton model before beginning this activity.

Assessment: The pretest should take only a few minutes for students to complete prior to beginning the activity. Many students will not be able to produce a linear transformation of the equation given (question 1), and probably none will know how to calculate \( V_{max} \) and \( K_m \) using the Lineweaver Burk double reciprocal plot (question 2) prior to completing the activity. The pretest could be used unchanged as a posttest to assess student learning.