

Free effect of substrate concentration and ph on the rate of enzyme reaction repo...

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Abstract

Enzymes are the components that enhance the reaction rate in a biological system by reducing the quantity of activation energy necessary to start a reaction. This experiment worked to determine the effect of pH and concentration of the substrate on the enzyme activity. The optimum pH for enzyme's best-working condition was determined to be pH 7 while the 4g was the concentration of the substrate that saturated the enzyme.

Introduction

Enzymes are the components that enhance the reaction rate in a biological system. The enzymes achieve this by reducing the quantity of activation energy needed to initiate the reaction. The enzymatic activity is highly dependent on the balance in a number of factors including temperature, pH, and the enzyme and substrate concentration (Lehninger, Nelson and Cox). Optimum conditions for these factors are needed for the optimum enzyme activity to be realized. Changing the level of pH from the optimum level for a given enzyme results in reduced enzymatic activity. Raising the substrate concentration results in an increase in the rate of enzyme activity until the enzyme is saturated with the substrate (Lehninger, Nelson and Cox).

This experiment worked to determine the effect of pH and concentration of the substrate on the enzyme activity.

Materials

The experiment was conducted using a virtual lab provided by McGraw-Hill Education (McGraw-Hill Education).

Experimental Procedure

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The experiment was started by first adjusting the pH using the buttons to the desired pH (3, 5, 7, 9 and 11). Starting with pH 3, substrate was added to the tubes each tube with its own concentration by clicking and dragging the paper with the substrate to the tube. The tube contained enzyme solution at equal concentrations. Using the monitor, the number of product molecules in one minute was displayed and recorded. The program was reset and experiment repeated at a different pH level and data recorded.

Results and Discussion

The number of molecules of the product formed per minute were recorded in Table 1 below.

The results were presented graphically as shown in Figure 1 below. The reaction that occurred at pH 7 gave the best initial rate of reaction with a great increase as substrate concentration increased. This shows that pH 7 is the optimum pH for the enzyme under investigation. The amount of product formed at 4 g and 8 g substrate concentration was similar indicating that the enzyme was saturated by 4g of the substrate and no effect on the rate of reaction with more increase in substrate concentration.

Figure 1: The relationship between the products formed per minute and amount of substrate determined at different pH levels.

Conclusion

The experiment worked to determine the effect of pH and concentration of the substrate on the enzyme activity. From the results, the optimum pH for the enzyme is pH 7 while the 4g is the concentration of the substrate that saturated the enzyme.

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- The relationship between concentration and initial reaction rate of an enzyme-catalyzed reaction increased exponentially and then stagnated after enzyme saturation point was attained. The relationship is thus nonlinear. As the concentration of the substrate increases, the number of product formed increased.
- The maximum initial reaction rate for the enzyme at pH 7 was 350×10^6 molecules per minute.
- The maximum initial reaction rate cannot be attained at low concentration of the substrate since the enzyme is not saturated with substrate.
- Optimum pH is pH 7
- Temperature regulating mechanisms are essential to enable the enzyme retain optimal structural configuration. This enables the enzyme to achieve the necessary interaction with the substrate.

Works Cited

Lehninger, A. L., D. L. Nelson and M. M. Cox. Lehninger principles of biochemistry. 4th. New York: WH Freeman, 2008. Print.

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