Responses of enzyme activity from ph and concentration essay sample

Science, Chemistry

Abstract

Enzymes are the key to many of the chemical reactions that our bodies depend on to live. Without enzymes, we would not exist. These biological catalysts speed up the reactions as well as reduce the amount of activation energy needed to complete the process. Knowing how important enzymes are to us, it is important to realize what they require to function. They need select conditions and rates to work right. These conditions can range from what level of pH to use or the right concentration of the enzyme itself. The rate of efficiently of the enzyme activity relies on these conditions. They will function poorly if the right condition is not available.

Exercise A tested how changes in pH affect's the enzyme activity. Catecholase was most productive at a pH of 6. If the pH was different, the results were less efficient. A pH of 4 was the least efficient pH. Exercise B displays how enzyme performance is related to the concentration of the enzyme. More potato juice resulted in a better reaction rate. Again, these experiments portray just how important the conditions are for a certain enzyme to function efficiently. Introduction

Enzymes are typically proteins that are necessary for many chemical reactions to take place. These chemical reactions take place in organisms and almost all crucial reactions in a biological cells need these enzymes. Enzymes act as biological catalysts. Their power as catalysts enables biological reactions to occur usually in milliseconds (Wolfenden, 2008). Conversion is the key to enzyme function. Substrates are defined as the

starting molecules whereas products are the ending molecules. Enzymes convert these substrates into

Dana Calderone

different products. However, enzymes are selective when it comes to choosing a substrate. The substrates bind to the enzyme’s active site. Enzymes have complex, tertiary structures. Enzymes are vital in speeding up a reaction. They achieve this by lowering the activation energy of a reaction (Klucevsek). Activation energy is the absolute minimum energy that must be inserted into a chemical system to achieve a chemical reaction. Enzyme activity can be manipulated by many factors such as enzyme concentration as well as the pH of their environment. The objective of this exercise is to learn the relationship of enzyme activity and the enzymes environmental conditions The hypothesis tested in exercise A was that the enzymes function will be affected if the pH of its environment is altered. The null hypothesis was that the enzyme’s function will not be affected if the pH changes.

Following exercise A, exercise B’s hypothesis was that the enzymes activity will be affected if the concentration is affected. The null hypothesis was that the enzyme function will not change if the concentration changes . In many fruits and vegetables one would find the enzyme catecholase. This particular enzyme is the enzyme used in the two studies. Catechol is this enzymes substrate which will separate from the catecholase in intact cells (Walker, 1995). However, damaged cells form an additional substance. This substance is formed when the two come into contact and catalyzes is the substance

defined as benzoquinone. This dark colored substance forms long chains that are the backbone for melanin. Melanin has a dark tincture and generates the coloration of bruised vegetables and fruits dark as well.

Methods and Materials

In order to conduct the pH experiment five tubes were prepared, each of them held 9mL of a particular pH buffer, 1 ml of potato juice and 1 ml of water (Table 1). These blanks were labeled and used in accordance with the Thermo Scientific Genesis 20 spectrophotometer. Labeling was identified by the number of the buffer as well as the letter “ B”. A spectrophotometer measures properties of light over the electromagnetic spectrum. The actual experimental tubes were prepared with the same elements, however one mL of the substrate catechol was added (Table 2). These tubes were labeled the same but instead of the letter “ B”, a letter “ T” was marked. The difference in total volume between sets of tubes was one mL.

The experimental tubes were covered with Parafilm and inverted several times. After 5 minutes, a cuvette was filled with the test tube pH 4B solution to blank the spectrophotometer. Then, a cuvette filled with the pH 4 test tube solution was inserted into the spectrophotometer and measured with the 420 nm wavelength. This procedure was repeated for the remaining test tubes. Exercise B required 4 test tubes labeled with “ A, B, C, or D” and they held the solution of different pH buffer and potato juice volumes, and 1 mL of water (Table 4). These tubes were the blanks for the spectrophotometer for recalibrating it.

The additional 4 experimental test tubes were composed of the same contents but 1 mL of the substrate catechol was added instead of the 1 mL of water (Table 2). These test tubes were labeled the same as the previous blanks. The spectrophotometer wavelength was set to 420 nm just like exercise A. After the spectrophotometer was adjusted using the blank A, the catechol was added to tube A. The tube was covered with paraffin and the absorption was measured within 5 seconds. The absorbance readings were continued for every minute for 6 minutes. Procedures were identical for the other 3 test tubes.

Discussion

The data from exercise A provided evidence to support the hypothesis that pH affects enzyme activity. The null hypothesis was rejected. In table 6 the solutions were contrasted by only the pH buffers. The pH buffers were 4, 6, 7, 8, and 10. The pH buffers caused the absorptions at wavelength 420nm to be different as well. Table 6 portrays that the lowest absorption of light was at a pH of 4. The greatest absorption was achieved in the pH of 6. For this reaction, a pH of 7 is the best to use. Visually, one can view this information in the graph A. 1. Here, one will find that the peak is at pH of 6, 0. 284.

Concluding exercise A, pH will manipulate enzyme activity in addition to its ability to speed up a reaction. In exercise B, it is confirmed that we can expect the reaction rate to depend on the concentration of the enzyme. At an absorbance of 420 nm, test tube “ D” had the most absorption of light. This tube happened to contain the 2mL of potato juice, the most potato juice in the experiment. Graph 2 shows that the enzyme functions relies on the

concentration. The line for test tube “ D” is exceptionally above the other test tube lines. In conclusion, exercise B’s hypothesis was accurate where the null hypothesis was rejected.

Literature Cited

Klucevsek, Kristin. “ Functions of Enzymes.” Education Portal. N. p., n. d. Web. 27 Oct. 2014. McRae, John A., Thompsonn, Beverly P., DeHay, Galen, Science Department, Tri-County Technical College. Biological Science I Laboratory Manual. Hayden-McNeil, 2014 Walker, John. “ Enzymatic Browning in Fruits.” – Enzymatic Browning and Its Prevention. N. p., n. d. Web. 27 Oct. 2014.

Wolfenden. “ Without Enzyme, Biological Reaction Essential to Life Takes 2. 3 Billion Years: UNC Study.” – UNC School of Medicine. N. p., 2008. Web. 13 Oct. 2014.