

To investigate the
ideal conditions for
enzyme action essay
sample



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Enzymes have one specific job and one specific substrate. The lock and key theory suggests that there is only one key per lock and this is a good way of explaining about enzymes. Here is an example:

Each enzyme has a certain place where they will produce a product.

Examples of digestive enzymes are:

- * The protease enzyme (pepsin) acts on proteins and produces amino acids - Acid in the stomach is needed.
- * The amylase enzyme acts on carbohydrates and produces sugars.
- * The carbohydrase enzyme acts on starch and produces glucose.
- * The lipase enzyme acts on fats also known as lipids and produces fatty acids and glycerol - bile is needed, bile breaks up fat and neutralises the stomach to slightly acidic.

Factors that could effect the experiment:

Temperature: Temperature will effect my experiment in two ways, if it is too hot the enzymes will be denatured. Denatured means the bonds in the enzyme break and the enzyme loses its shape and it can no longer do its specific job. If however it is too cold the enzymes will not have enough energy to react.

pH: The pH in the stomach is usually acidic, only the enzymes used to this pH will be able to react in these conditions.

Surface area: The surface area is important because the larger the surface area the more enzymes can act on it, which makes it easier and quicker to break down the food.

Amount of food used: The bigger the size of the food (if the same amount of enzymes are acting on it) the slower it will take.

Processes:

Ingestion: This is where the food enters the mouth, in the mouth the food is chewed and mixed with enzymes. When the food is chewed, it is broken down and the surface area is increased. This is for the enzymes to work on later.

Digestion: This is the breaking down of large molecules to small molecules, it is also the process in which solid food is dissolved by enzymes to make a solution.

Absorption: The small intestine consists of duodenum and ileum. Nearly all the absorption happens in the ileum. The ileum is quite long so has a large absorption area. The blood absorbs the nutrients from the food here.

Method:

We will use temperature as our independent value, the one we will change. We will keep the pH the same throughout. We will time each one so the time will be different for each. We are choosing pepsin (protease enzyme) as our enzyme, to find out the ideal conditions for enzyme action. We will be digesting egg white (also called albumen) and when it goes clear we will

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know it has been digested. We will set up different test tubes with pepsin, albumen and hydrochloric acid in (this is used because acid is present in the stomach.) The tubes will be heated with a water bath to different temperatures from 0 - 60 degrees Celsius. We will keep the amount of acid, egg white and pepsin the same; we will have 3cm cubed of pepsin, 5cm cubed of egg white and 1cm cubed of hydrochloric acid. We will use 6 water bathes and 6 test tubes.

Equipment needed:

To carry out our investigation we will need:

- * 6 water bathes
- * 6 test tubes
- * Albumen (30cm cubed)
- * Pepsin (18 cm cubed)
- * Hydrochloric acid (6 cm cubed)

Here is a picture of what we intend to do.

Prediction:

I predict that when the mixture is below 20 degrees it will not be able to digest, I think this because I know that the body temperature is 37 degrees Celsius. More than 20 below that there will not be enough heat, the enzymes will not have enough energy to react and above 50 degrees the enzymes will

be denatured. Therefore I predict the temperature that will have the shortest time to react will be in between 20 and 50 degrees in the middle of this is around 30 or 40. This is my prediction for this investigation.

Range:

We intend to use temperatures between 0 and 50 degrees Celsius. Our amount of products stays the same, we will always be using 3cm cubed of pepsin, 5 cm cubed of egg white and finally 1cm cubed of hydrochloric acid. Our temperature range is 50 degrees Celsius.

Planning our results:

When we have completed our experiment I will place the results in a table, similar to the one below.

I will also show my results in a graph comparing the temperature with the time. Though I will only be able to plot the ones which finish dissolving. Some may not complete the process. On the graph the x-axis will be showing the time in minutes and the y axis will be showing the temperature in degrees Celsius. I will check my prediction and explain the reasons, and why I was correct or incorrect. Doing this will increase my knowledge and understanding.

Preliminary work:

Our preliminary work consists of finding out that acid is needed in the stomach for digestion to work, and if relevant bile is needed to digest using lipase enzymes. The information found about acid being needed was

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essential to this experiment as we needed to add Hydrochloric acid to make it work. We also drew a graph in the past that showed us the effects of temperature and pH also on the protease enzyme; this showed no particular pattern so I was interested in the part that temperature against time played in the process.