

# Effects of temperature on the activity of lipase essay sample



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**Aim:**

To investigate the effects of temperature on the activity of lipase enzyme on milk which contain fats or lipids.

**Introduction:**

Enzyme is a kind of biological catalyst that made up of protein. It can speed up the metabolic reactions on various kinds of substances. Like lipase can break down lipid into glycerol or fatty acids in milk. Since enzyme is made up of protein which easily affected by varies temperature. This experiment is carried out to find the effects of temperature on the activity of lipase by adding phenolphthalein and observes how long it takes to decolorize from pink, because milk is slightly alkaline that change to pink after adding phenolphthalein. In order to enhancing the result and the colour, adding sodium carbonate is needed.

**Principle:**

The recommend rationale of the volume of enzyme (lipase) to sodium carbonate to substrate (milk) is 1: 7: 5. The purpose of adding sodium carbonate is to enhance the result of the experiment and to give an obvious change of the colour of phenolphthalein from pink to colour which indicated that the lipase is the mixture already breaks down all the fat or lipids into fatty acid and glycerol inside the milk. By timing how long does the enzyme has turn the alkaline mixture into acidic by observing the colour change.

**Hypothesis:**

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The rate of the lipase activity is affected by the various temperature, as the temperature increase, the activity of the enzyme also increase but when the temperature is at the extreme cold or hot temperature, the reaction of the enzyme stops or take a relativity longer period of this in order to breaking down lipid. There also is a specific temperature range which is the temperature near to the body temperature that the enzyme acts at a fastest rate.

Variable tables:

Independent variables

Dependent variables

Controlled variables

Temperature of the mixture

pH value changes

Time taken in the setup

(lipase activity)

Volume of milk

Volume of enzyme

Volume of sodium carbonate

Assumption:

1. Assume that the concentration of the lipid inside every 5mL of milk are the same.
2. Assume that the concentration of the lipase in every 1mL are the same.
3. Assume that there are no substances in side the milk will reacts with the sodium carbonate and phenolphthalein.

## Apparatus and materials

Boiling tube x4 pipette filler

Test tube x8 1mL lipase x4

Plastic beaker x2 7mL sodium carbonate x4 Thermometer x2 5mL milk x 4

Stop watch x2 10mL pipette x 2 ice (for water bath) phenolphthalein 1mL pipette x1 100°C hot water (for water bath)

## Procedures:

1. Measure 1mL of lipase using 1mL pipette with pipette filler, 7mL of sodium carbonate and 5mL of milk using 10mL of pipette with pipette filler. Pour the content into the test tube. Repeat the step for 4 times.
2. Put the test tube containing enzyme, milk, sodium carbonate and an empty boiling tube in water bath in respectively. In order to make all the solutions reach equilibrium. Maintain the temperature.
3. Mix milk and sodium carbonate, in the empty boiling tube then add 5 drops of phenolphthalein. Mix well. The solution should be pink.
4. Pour 1mL of enzyme in the boiling tube and start timing. Mix well.
5. Through out the processes, keep on shaking the boiling tube to let the enzyme reacts with the milk.
6. Stop the stop watch when the mixture inside the boiling tube changes to the colour of the milk.
7. Repeat step 2-5 with 8°C, room temperature (26°C), 40°C, and 71°C.
8. Record the results.

## Precautions:

1. Sodium carbonate is an alkaline which is harmful. Should wear safety goggles. 2. Paying attention in handling hot water and ice. Should using towel in transferring hot water and ice.

Limitations

Improvements

There are some changes in temperature through out the experiment, which might affect the activity of the enzymes or it might cause denature at a very high temperature. A more advanced advice is needed to maintain a certain temperature for the reaction between the lipase and the lipids. Since the phenolphthalein only would change to colourless when the solution becomes acidic or neutral, which can not be obvious for the colour change, resulting an error in the result? A pH meter is needed to have a more accurate result for the investigation.

Conclusion:

According to the results, it shows that it take a longer time at an extreme temperature or even denature at a high temperature. Because at a low temperature, the kinetic energy in the enzyme is relatively low, which affecting the chance of the collision of the enzyme and the substrate, which require a longer period of time for the lipase to break down lipids inside the milk in to glycerol and fatty acid. As the lipase is in a very hot temperature, since the enzymes was made up of protein, which is easily be digested or even denatured, resulting there are no lipids can be broken down by the lipase. And the results would show that the lipid would be unable to be broke down. From the above result, at 40°C, it has the fastest rate of breaking

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down the lipids into fatty acid, and as the body temperature is around 37°C, which is the optimum temperature for the enzyme to breaking down certain substances. Which can explains that the food substances are digested in our body at the fastest rate.