

# [Enzyme lab example](https://assignbuster.com/enzyme-lab-example/)

Enzyme Lab Purpose: To compare the action of the enzyme catalase, to a non-protein catalyst under different conditions.

Observations:

| | Observations | Rate of Reaction | Interpretations |

| A | Sand |- Sand piled up at the bottom of | 0 |- There is no reaction between sand and| | | | the test tube and no bubbles | | hydrogen peroxide because sand does | | | | arose | | not contain any catalysts or enzymes to| | | | | | break down hydrogen peroxide | | | MnO2 |- Reaction occurred right away, | 5 |- MnO2 acts like a catalyst which | | | | bubbles rose almost to the top of| | breaks down H2O2 into water and oxygen | | | | the tube | | gas with lower activation energy |

| B | Liver |- Reaction occurred right away, | 4 |- Liver contains large amounts of the | | | | and big, white bubbles rose the | | enzyme catalase, which break down H2O2.| | | | top of the test tube | | This made the reaction occur quickly | | | | | | and form bubbles. | | | Potato |- Very little bubbles appeared | 2 |- The reaction was very moderate and | | | | from the reaction, and did not | | did ot occur quickly because potato | | | | rise very high in the tube or | | does not have a lot of the enzyme | | | | occur quickly | | catalase |

| C | Used liver + Fresh liver |- Some bubbles formed and the | 3 |- The reaction should have had a higher| | | | reaction was moderate | | rate of reaction, because the enzymes | | | | | | in the used liver are still active and | | | | | | can be used in the reaction again. The | | | | | | fresh liver can also perform this | | | | | | reaction with its catalase enzyme. Due | | | | | | to an error or impurity of equipment, | | | | | | the reaction was not as strong. | | Used liver + H2O2 |- Reaction occurred quickly and a| 4 |- The enzyme in the liver is still | | | | lot of big bubbles formed and | | active and can be used over again, | | | | rose to the top of the test tube | | because enzymes never get used up |

| D | Crushed Liver |-Reaction happened immediately, | 5 |- Liver contains a large amount of | | | | and a lot of bubbling occurred | | catalase enzyme, which breaks down H2O2| | | | for a while with large, white | | very quickly. Since the liver is | | | | bubbles, and rose to the top of | | crushed, this reaction occurred even | | | | the test tube | | faster because there is a larger | | | | | | surface area of the liver for the H2O2 | | | | | | to react with. | | Crushed Potato |- Very few bubbles that were | 3 |- Since the potato is crushed, there is| | | | small formed and they did not | | more surface area for the H2O2 to react| | | | rise very high in the test tube | | with, but potato does not contain any | | | | | | enzymes to break down H2O2, so this | | | | | | reaction was moderate and did not occur| | | | | | quickly.

| E | Boiled Liver | - No bubbles rose to the top of | 1 |- No reaction and bubbles formed, | | | | the test tube, and a light, white| | because the boiling of the liver caused| | | | cover formed on top of the liver | | denaturing of the proteins, and | | | | with very little, small bubbles | | denatured catalase proteins can not | | | | | | function | | | Liver at 37° C |- Reaction occurred quickly and | 5 |- This reaction occurred and formed | | | | large, white bubbles formed and | | large bubbles that rose to the top | | | | elevated up the test tube | | because the liver is 37° C, which is | | | | | | normal human body temperature. Catalase| | | | | | operates and breaks down H2O2 best at | | | | | | this temperature. | | | Liver at 0° C |- No bubbles formed or rose to | 0 |- No reaction occurred when the liver | | | | the top of the test tube. No | | was at 0(C because this condition is | | | | reaction occurred. | | too cold for the catalase enzymes to | | | | | | function. Enzyme activity slows down at| | | | | | any temperature below 37° C, and it is | | | | | | the slowest at 0 degrees. Almost no | | | | | | enzyme activity occurs.|

Questions:

1. The differences in the rates were mainly because of the different temperatures of the liver, the different particle sizes of the liver and potato, and the product used with H2O2 in the reaction. The reactions that had the fastest rates had the liver as the product used in the reaction with hydrogen peroxide. Also, reactions that had liver at normal body temperature (37° C), and had a larger particle size for the larger surface area had fast rates of reaction.

2. H2O2 breaks down when other catalysts that can be oxidized by it are present. Because H2O2 is an unstable molecule, some inorganic substances like MnO2 can be oxidized by it, and they release oxygen gas in the reaction.

3. Temperature affects the rate of enzyme action very much. At low temperatures, the enzyme activity is very slow, because the molecules have low kinetic energy and fewer collisions occur between them. This is proven in part E of the lab, where there was no reaction and enzyme activity when the liver was 0° C. At high temperatures, the enzyme activity increases because the molecules have higher kinetic energy and more collisions occur. However, the maximum temperature the enzyme will stay active until is about 40° C. After the temperature reaches higher than 40° C, the protein enzyme will start to denature and slow down.

Particle size also affects the rate of enzyme action. Smaller particles allow the rate of enzyme activity to be very high because there is a larger surface area for the enzyme to react with and break down. This is proven in part D of the lab, where there was a very fast and active reaction with crushed liver and hydrogen peroxide. The large surface area of the crushed liver allows more space for the enzymes to work on and break down hydrogen peroxide. 4. No, the results would not be different if the dog liver was used for this investigation. This is because the catalase enzyme will stay active as the temperature increases, up to about 40° C.

If the liver is higher than 40 degrees, the enzyme will denature and not work. Since the dog liver is exactly 40° C, the results will be the same, because the enzyme will work at a temperature of 40° C, but not any higher. In conclusion, this lab helped consolidate the understanding of how enzymes work, and how temperature and particle size affects the rate of enzyme activity. This activity was an interactive way to see how the enzymes actually function, through the liver and potato.