

# CATALASE ENZYME

## INTRODUCTION

Catalysts are chemical substances that speed up chemical reactions. In the living cells, many proteins are catalysts, and those substances are called **enzymes**. For instance, an enzyme called *amylase* is present in human saliva, and it breaks down starch. Many different enzymes can be found in the alimentary canal (e.g. in the stomach and the small intestine).

Enzymes are widely used for industrial purposes, and you can find enzymes in many different products. For example, many washing powders contain enzymes that makes the washing process faster. By using enzymes, it is also possible to use lower temperatures and conserve energy.

Hydrogen peroxide ( $\text{H}_2\text{O}_2$ ) is a slightly toxic substance which is formed in the cell respiration process as a side product. Cells want to get rid of hydrogen peroxide and they produce *catalase* that makes hydrogen peroxide degrade. As a result, water and oxygen molecules are produced.



In human body, catalase can be found especially in liver, kidney and blood.

- When using hydrogen peroxide, use a protective coat and gloves.
- Hydrogen peroxide can easily bleach clothes and hair. Do not put too much hydrogen peroxide in the test tubes to avoid violent reactions.
- Do not mix or shake tubes that contain hydrogen peroxide.

## QUESTIONS BEFORE THE TASK

- What chemical substances are formed when hydrogen peroxide is degraded?
- Hydrogen peroxide is widely used as a disinfectant. Why?
- Do you know any other enzymes? Think about the digestive system.

## EQUIPMENT

- Hydrogen peroxide (3 %)
- Pasteur pipettes
- Microtubes
- Tube holder
- Samples, such as
  - Liver (frozen, molten, boiled)
  - Other tissue samples
  - Seed coat and storage cotyledons (from a pea)
  - Potato (frozen, molten, boiled)

## INSTRUCTIONS

1. Take empty microtubes and put them in the tube holder.
2. Take small pieces of tissue samples and place them in the bottom of the tube. Choose a microtube for the negative control.
3. Prepare the negative control: add a few drops of hydrogen peroxide (max. 0,5 ml) in an empty tube. Observe the reaction.
4. Add a few drops of hydrogen peroxide on the top of tissue samples. Do not shake, mix or close the tubes! Observe the reactions.
5. Mark your results on the table. What kind of reaction did you see in a tube?

Sample	The speed of reaction (0 = no reaction + = slow reaction ++ = fast reaction +++ = very fast reaction)

## QUESTIONS AFTER THE TASK

- What makes hydrogen peroxide decompose faster in some tissue samples?
- Did you observe any difference between different tissue samples? What's the reason for this?
- Where did you observe the fastest reaction and why?
- What would happen if the cells did not contain hydrogen peroxide?