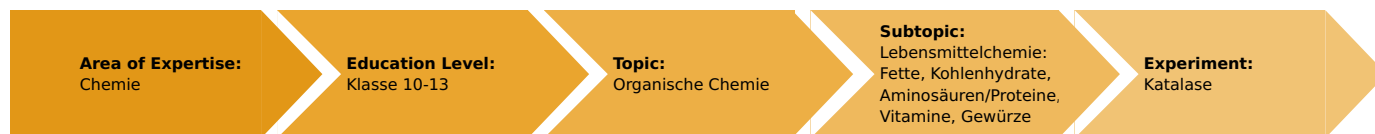


# Catalases (Item No.: P7188900)

## Curricular Relevance



### Difficulty



Intermediate

### Preparation Time



10 Minutes

### Execution Time



20 Minutes

### Recommended Group Size



2 Students

### Additional Requirements:

### Experiment Variations:

### Keywords:

enzyme, catalases

## Task and equipment

## Information for teachers

## Additional Information

Enzymes play a decisive role in biological processes. They are called bio-catalysts. Potatoes contain a clearly detectable quantity of catalase.

## Notes on content and learning objectives

- Animal and vegetable foods contain the enzyme catalase.
- Catalases split hydrogen peroxide into oxygen and water.
- Enzymes are high molecular protein compounds which can be denatured by heat and heavy metal ions.

## Notes on the method

The significance of enzymes as bio-catalysts can be gone into in more depth with various metabolic pathways. The denaturization of proteins is described in the experiment "coagulation of proteins".

## Fundamentals and remarks

Hydrogen peroxide is a strong poison to cells. The catalase present in living tissue decomposes the hydrogen peroxide formed in various metabolic reactions.

The enzyme peroxidase can also decompose hydrogen peroxide.

From the intensity of the catalase reaction, it is partly possible to determine how carefully fresh foods were processed.

## Hints on going deeper

- This theme can be used as an introduction to the teaching unit "biocatalysts". Classroom discussions on harm to health from environmental contamination could be used as follow up.

## Hints on set-up and procedure

### Preparation:

Other foods, such as blood, fresh fruit, porridge oats, milk and dairy products, can also be used in this experiment.

3 % hydrogen peroxide should be prepared centrally by mixing one part by volume of 30 % hydrogen peroxide with 9 parts by volume of distilled water.

Notes on the students experiments:

The generation of elementary oxygen during the catalase reaction can be demonstrated in a teacher's experiment as follows: Hold a glowing wood splint or candle wick at the mouth of a test tube containing grated potato after adding hydrogen peroxide. The luminous flame of the wood splint or candle wick is an indication of the generation of oxygen.



## Hazard and Precautionary statements

Fehling's solution I:

H411: Toxic to aquatic life with long lasting effects.

P273: Avoid release to the environment.

Hydrogen peroxide:

H271: May cause fire or explosion; strong oxidizer.

H302: Harmful if swallowed.

H314: Causes severe skin burns and eye damage.

H332: Harmful if inhaled.

H335: May cause respiratory irritation.

## Hazards

- Hydrogen peroxide solutions are corrosive. Avoid skin contact with this chemical.
- Wear protective glasses and protective gloves.

## Waste disposal

Pour the solutions to drain, and solid material to the normal waste.

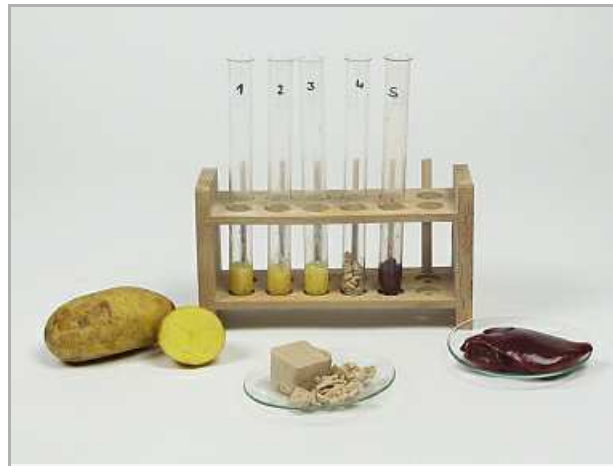
# Catalases (Item No.: P7188900)

## Task and equipment

### Task

#### Why are some foods decomposed by hydrogen peroxide solution?

Detect catalases in various foods.



Equipment



Position No.	Material	Order No.	Quantity
1	Support base, variable	02001-00	1
2	Support rod, stainless steel, l=370 mm, d=10 mm	02059-00	1
3	Ring with boss head, i. d. = 10 cm	37701-01	1
4	Wire gauze with ceramic, 160 x 160 mm	33287-01	1
5	Glass beaker DURAN®, short, 400 ml	36014-00	1
6	Test tube rack for 12 tubes, holes d= 22 mm, wood	37686-10	1
7	Test tube, 180x18 mm,100pcs	37658-10	(5)
8	Test tube holder, up to d 22mm	38823-00	1
9	Test tube brush w. wool tip,d25mm	38762-00	1
10	Pipette with rubber bulb	64701-00	2
11	Knife, stainless	33476-00	1
12	Spoon, special steel	33398-00	1
13	Labor pencil, waterproof	38711-00	1
	Butane burner f.cartridge 270+470	47536-00	1
	Butane cartridge CV 300 Plus, 240 g	47538-01	1
	Fehling's solution I 1000 ml	30079-70	1
	Water, distilled 5 l	31246-81	1
	Hydrogen peroxide, 30%, 250 ml	31710-25	1
	Boiling beads, 200 g	36937-20	1
Additional material			
	Cutting board		
	Yeast		
	Potato		
	Liver		
	Reibe		

## Set-up and procedure

### Set-up

### Hazards

- Hydrogen peroxide solutions are corrosive. Avoid skin contact with this chemical.
- Wear protective glasses and protective gloves.



### Setup

Number five test tubes from 1 to 5 and stand them next to each other in the test tube rack (Fig. 1).

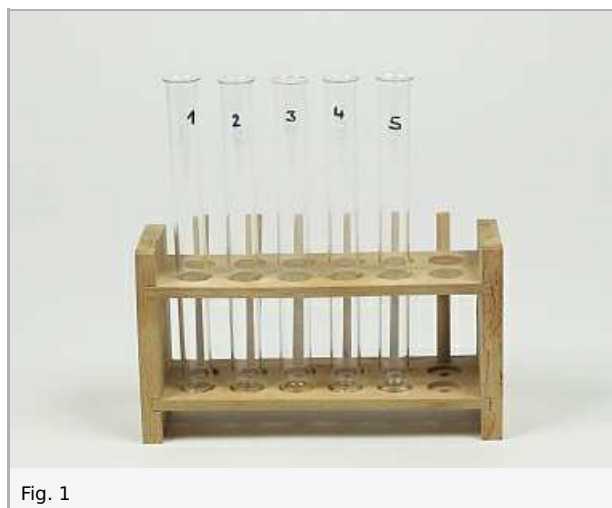


Fig. 1

Assemble the stand as shown in figures 2 to 6. Fasten the support ring to the support rod and place the wire gauze on it. Adjust the height of the support ring so that the flame of the burner just reaches the wire gauze.



Fig. 2



Fig. 3



Fig. 4



Fig. 5



Fig. 6

Half-fill a 400 ml beaker with water and add a few boiling stones (Fig. 7). Heat it to boiling, then put it aside. Extinguish the bunsen burner flame!



Fig. 7

## Procedure

Grate or cut up a peeled, raw potato with a grater or a knife. Fill the mash to a height of 2 cm in each of the test tubes 1, 2 and 3 (Fig. 8).



Fig. 8

Put a few crumbs of crumbled yeast into test tube 4. Cut a nut-sized piece from the liver, chop it up and put it into test tube 5 (Fig. 9).



Fig. 9

Place test tube 2 with the potato mash in the beaker of hot water for about 10 minutes (Fig. 10). Add 5 drops of Fehling's solution I to the potato mash in test tube 3 (Fig. 11).



Now successively add hydrogen peroxide solution (3 %) to a height of 5 cm in each of the five test tubes (Fig. 12). Observe in which test tubes gas bubbled are formed.



## Waste disposal

Pour the solutions to drain, and solid material to the normal waste.



## Report: Catalases

### Result - Table 1

Note your observations in the following table.

Test tube	Food	Reaction
1	Potato, raw	1
2	Potato, heated	1
3	Potato, with Fehling's I	1
4	Yeast	1
5	Liver	1

### Evaluation - Question 1

Formulate the equation for the reaction when hydrogen peroxide decomposes.

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### Evaluation - Question 2

Draw conclusions from your observations.

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### Evaluation - Question 3

Explain the word "enzyme".

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### Evaluation - Question 4

Complete the following statements.

1. Catalases in raw ..... and ..... products convert hydrogen peroxide to ..... and .....
2. Strong ..... and ..... inactivate catalases.