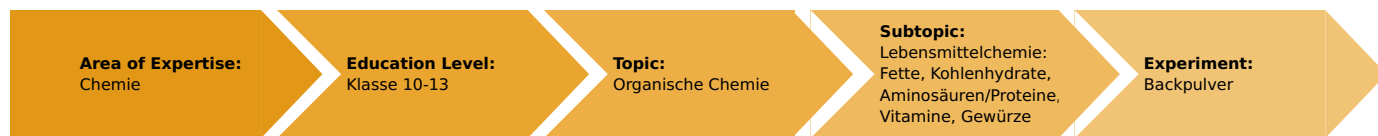


# Baking powder (Item No.: P7188600)

## Curricular Relevance



### Difficulty



Easy

### Preparation Time



10 Minutes

### Execution Time



10 Minutes

### Recommended Group Size



2 Students

### Additional Requirements:

### Experiment Variations:

### Keywords:

food chemistry, baking powder

## Task and equipment

## Information for teachers

## Additional Information

In addition to yeast baking powder is the most popular baking agent. Baking powder provides the bubble formation and thus lightens the pastry. Some students know the properties of sodium bicarbonate by using effervescent tablets, vitamin tablets, medicines or soda for making sherbet.

## Learning objectives

- Baking powder contains sodium bicarbonate as baking agent.
- Baking agents are substances, which liberate carbon dioxide under the influence of moisture or heat, thus lightening the pastry.

## Notes on the set-up and procedure

### Preparation:

Instead of vinegar also other diluted acids can be used.

### Notes on the students experiment:

Baking powder contains beside sodium bicarbonate also an acid carrier and a separating agent. The separating agent has the purpose of preventing a premature conversion. When water is added to the baking powder, a part of the sodium bicarbonate reacts under formation of carbon dioxide. For the quantitative conversion of sodium bicarbonate the addition of acid is therefore necessary.



## Hazards

- Wear protective glasses!

## Notes on the method

Similarly, the content of sodium bicarbonate in effervescent powders and vitamin tablets can be determined. Instead of vinegar

distilled water should then be filled in the beaker.

The individual components of baking powder can be determined qualitatively by the following reactions:

- Sodium: Flame colouration
- Carbonate: using acids
- Phosphate: using ammonium molybdate
- Starch: using iodine potassium iodide solution

## Fundamentals and remarks

Baking powder contains, in addition to the leavening agent, an acid carrier and a separating agent.

Sodium bicarbonate, salt of hartshorn ( $\text{NH}_4\text{CO}_3$ ) and potash ( $\text{K}_2\text{CO}_3$ ) are used as leavening agent.

Diphosphoric acid, sodium and calcium salts of phosphoric acid, tartaric acid and tartar are mainly added as acid carriers.

Separating agents, which have the purpose of preventing a premature conversion by moisture, are usually starches or corn flours.

## Waste disposal

The solution in the beaker can either be poured to drain or be used in further experiments.

## Baking powder (Item No.: P7188600)

### Task and equipment

#### Task

#### How much leavening agent is present in baking powder?

Determine the content of sodium bicarbonate in baking powder.



**Equipment**



Position No.	Material	Order No.	Quantity
1	Glass beaker DURAN®, short, 250 ml	36013-00	1
2	Graduated cylinder 100 ml, PP transparent	36629-01	1
	Compact Balance, OHAUS TA 302, 300 g / 0.01 g	49241-93	1
Additional material			
	Baking powder		
	Vinegar		

## Set-up and procedure

### Set-up

### Hazards

- Wear protective glasses!



### Set-up

Clean a 250 ml glass beaker and thoroughly dry it.

## Procedure

Pour 100 ml of vinegar into the clean beaker (Fig. 1). Determine the mass of the beaker with vinegar.



Fig. 1

Open a package of baking powder at one corner. Place the open package so on the balance, that no baking powder falls out and determine the mass of the package.

Slowly pour about half of the baking powder into the beaker containing vinegar (Fig. 2).



Fig. 2

Determine the mass of the half empty package of baking powder.

When no more gas bubbles are formed in the beaker, determine the mass of the beaker plus contents.

## Waste disposal

The solution in the beaker can either be poured to drain or be used in further experiments.

## Report: Baking powder

### Result - Table 1

Note the determined masses in the table.

Object	Mass in g (determined)
Beaker with vinegar	1 ±0
Baking powder package, full	1 ±0
Baking powder package, half empty	1 ±0
Beaker with vinegar and baking powder after the reaction	1 ±0

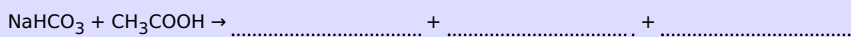
### Result - Table 2

Note the calculated masses in the table.

Object	Mass in g (calculated)
Mass of baking powder added	
Mass of beaker with vinegar and baking powder before the reaction	
Difference in the masses of the beaker with vinegar and baking powder before and after the reaction	

### Evaluation - Question 1

Complete the equation for the reaction and write the appropriate molecular mass below each of the empirical formulas:



..... g/mol + ..... g/mol → ..... g/mol + ..... g/mol + ..... g/mol

### Evaluation - Question 2

Calculate the sodium bicarbonate content of baking powder using the following equation:

$$(\text{Difference in mass}^1 \text{ in g} \cdot 84 \text{ g/mol} \cdot 100) / (\text{Mass added}^2 \text{ in g} \cdot 44 \text{ g/mol}) = \% \text{ NaHCO}_3$$

<sup>1</sup>Difference in the masses of the beaker with vinegar and baking powder before and after the reaction

<sup>2</sup>Mass of baking powder added

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### Evaluation - Question 3

Taking the results from Question 2 into consideration, calculate how much sodium bicarbonate is contained in a package of baking powder (15 g).

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### Evaluation - Question 4

How many litres of carbon dioxide are generated from the calculated quantity of sodium bicarbonate, when, under standard conditions, 1 mol of sodium bicarbonate forms 22.4 l of carbon dioxide?

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### Evaluation - Question 5

Draw conclusions from your observations.

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### Evaluation - Question 6

Complete the following statements:

1. Baking powder contains mainly ..... and an .....
2. .... is liberated by ....., ..... and .....
3. The ..... create ..... in the cake, pastry, etc., which ..... it and make it more easily .....

### **Evaluation - Question 7**

Find out from the food regulations, which leaving agents other than baking powder are used in baking.

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### **Evaluation - Question 8**

How does yeast function when it is used to lighten baked products?

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