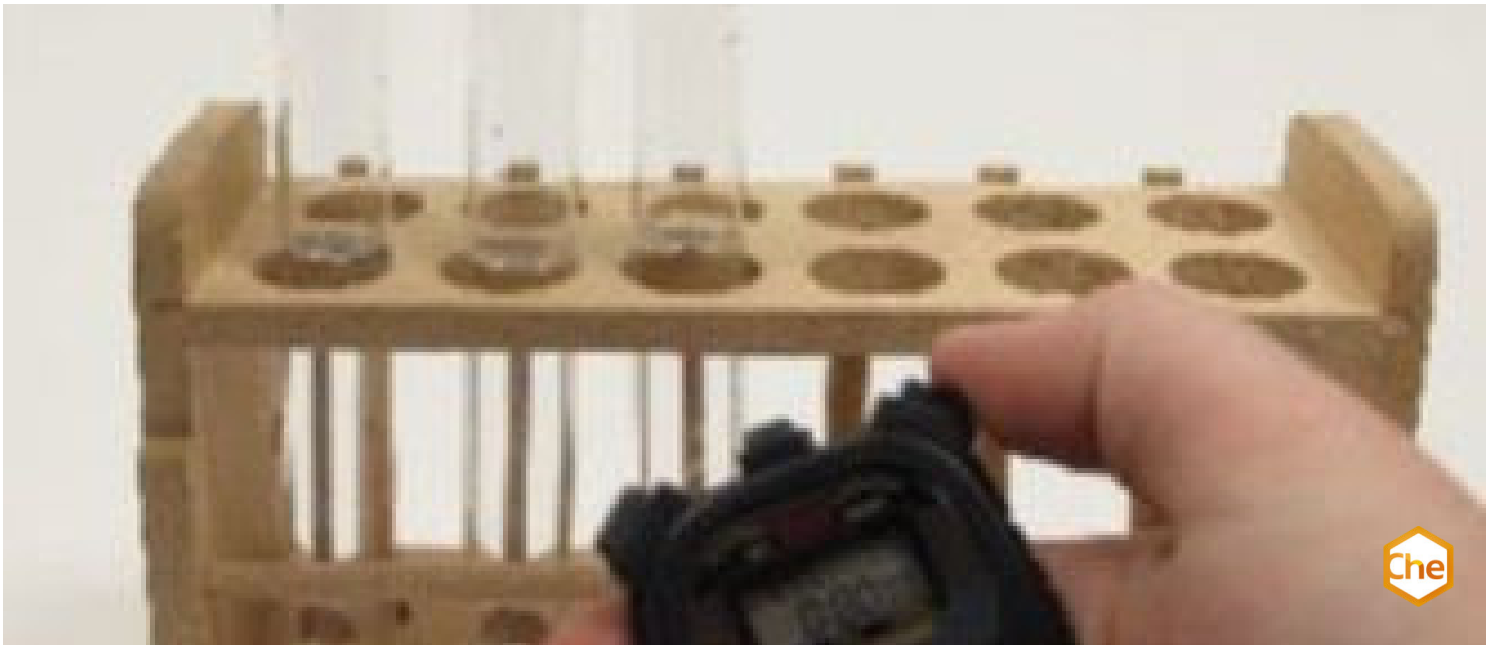
Acid strength



Chemistry | Inorganic chemistry | Acids, bases, salts

Difficulty level	Group size	Preparation time	Execution time
easy	2	10 minutes	10 minutes

This content can also be found online at:

http://localhost:1337/c/5f56b336742d0c00034be2e7

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Teacher information

Application

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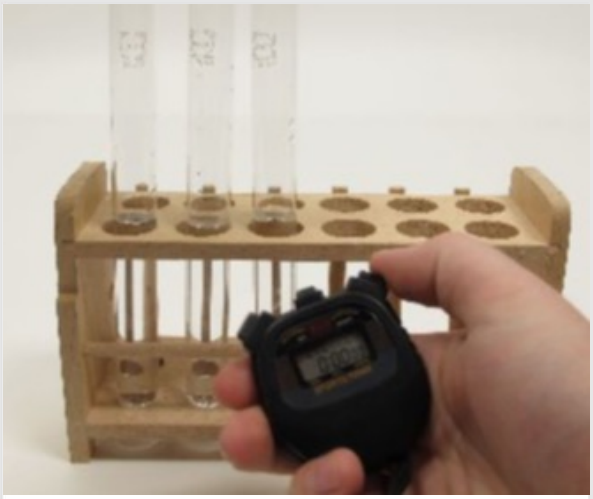

Experiment set-up

In general, acids can be classified according to their strength. The descriptive term acid strength (= reactivity towards metals) used here is based on the colloquial meaning and the imagination of the students. However, since the dissolution pressure of metals in acids is proportional to the concentration of H_3O^+-ions the result found here is the same as when applying the chemical definition. In this experiment, the students measure the reaction time until total dissolution of magnesium ribbon pieces in different acids.

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Other teacher information (1/2)

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Prior knowledge

- The pH value is a measure of the oxonium concentration H_3O^+-ions in water. The larger the H_3O^+-ion concentration, the lower the pH value.
- The degree of dissociation of an acid in solution determines its strength. Acids that dissociate almost completely (100%) in aqueous solution are called "strong". Acids that dissociate only about 1% or less are called "weak".

Scientific principle

The students put a piece of magnesium ribbon into three different acids with the same concentration at the same time and measure the time until the total dissolution of the metal parts.

Preparations:
Provide about 0.5 M acids. The concentrations do not have to be observed exactly, but should be largely the same among each other.

Other teacher information (2/2)

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Learning objective

In this experiment the students learn that there are strong and weak acids. In general, these different acids (assuming the same concentration) can be distinguished by their reaction speed with other reaction partners, e.g. when metals are dissolved by an acid.

Tasks

1. Measurement of the reaction time until complete dissolution of the metal parts.
2. Representation of the three processes (reactions) in word equations.

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Safety instructions

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- Acids cause severe burns.
- Use safety glasses/protective gloves!
- The general instructions for safe experimentation in science lessons apply to this experiment.
- For H- and P-phrases please consult the safety data sheet of the respective chemical.

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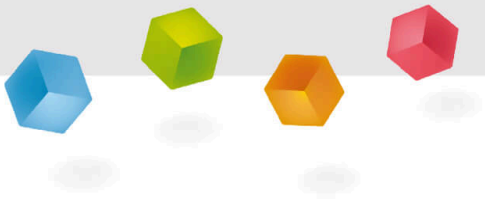

Student Information

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Motivation

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Warning symbol for corrosive substances

Acids and their typical properties to attack or even decompose substances we constantly encounter in our everyday life and in chemistry lessons. Even our body makes use of these acid properties in our stomach. A certain amount of hydrochloric acid in our gastric juice helps us to break down the food we eat in order to digest it better. It is especially important for our body that the right acid is present in the right concentration in our gastric juice in order not to damage the stomach.

Tasks

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Are there different strength acids?

- Examine whether acids react at different rates.

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Equipment

Position	Material	Item No.	Quantity
1	Digital stopwatch, 24 h, 1/100 s and 1 s	24025-00	1
2	Test tube rack for 12 tubes, holes d= 22 mm, wood	37686-10	1
3	Protecting glasses, clear glass	39316-00	1
4	Scissors, l = 110 mm, straight, point blunt	64616-00	1
5	Test tube brush w. wool tip,d20mm	38762-00	1
6	Test tube, 180x18 mm,100pcs	37658-10	1
7	Magnesium, ribbon, roll, 25 g	30132-00	1
8	Sulphuric acid, 95-97%, 500 ml	30219-50	1
9	Ortho-phosphoric acid 85% 250 ml	30190-25	1
10	L /+/ tartaric acid 100 g	30240-10	1

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Structure

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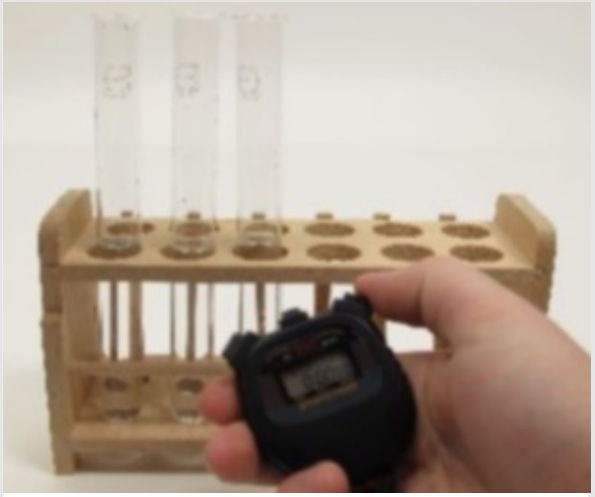

Experiment set-up

- Take three test tubes and label them with 1, 2 and 3
- Place the test tubes side by side in the test tube rack.
- Get the stopwatch ready.

Procedure (1/2)

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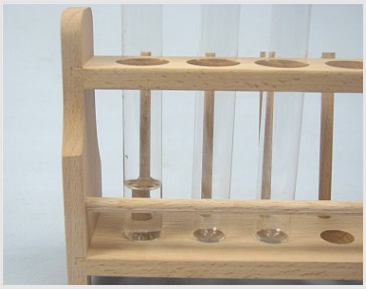

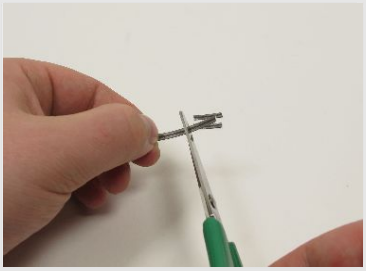

- Fill half of the first test tube in the test tube rack with sulphuric acid (see figure above left)
- The second test tube is filled with phosphoric acid and the third with tartaric acid
- All three test tubes should now be filled with approx. 4 -5 cm acid
- Now take the magensium band and a pair of scissors (see picture below left)
- Cut three pieces of equal size (approx. 1 cm long) from the magnesium ribbon.

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Procedure (2/2)

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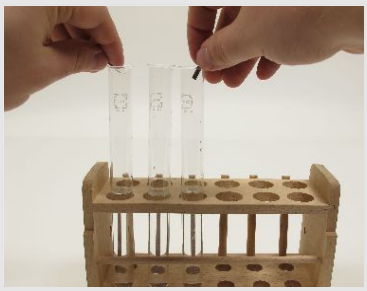

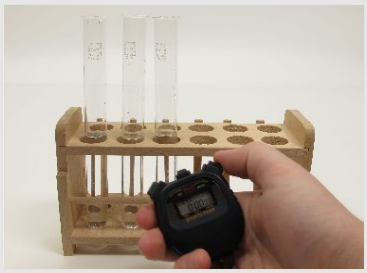

- Put a piece of magnesium ribbon into each of the three test tubes simultaneously and use the stopwatch to measure the time until the metal parts dissolve completely.
- Note the measured times in a table.

Disposal

- Place the contents of the test tubes in the collection container for acids and alkalis.

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Report

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Table

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Enter the reaction time in the table!

Acid	Reaction time (min)
Phosphoric acid	
Sulphuric acid	
Tartaric acid	

Task 1

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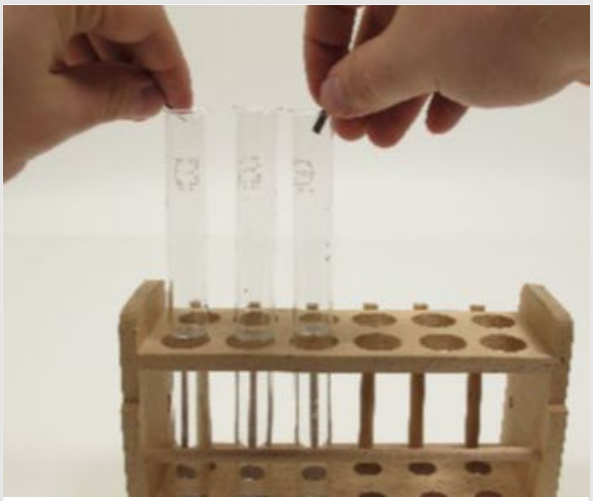

Addition of the magnesium strip

Addition of the magnesium pieces

After adding the magnesium pieces, the acids _____ up, a _____ is formed which drives the magnesium band upwards. The sulphuric acid dissolves the magnesium _____, the tartaric acid _____.

Check

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Task 2

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Magnesium, like other base metals, is absorbed by acids...

...oxygen evolution dissolved.

...hydrogen evolution dissolved.

Give the processes in a word equation !

[ ] + phosphoric acid → [ ] + [ ]

[ ] + sulphuric acid → [ ] + [ ]

[ ] + tartaric acid → [ ] + [ ].

Check

Slide	Score / Total
Slide 15: Addition of magnesium pieces	0/4
Slide 16: Multiple tasks	0/13

Total amount 0 / 17

Solutions Repeat Exporting text

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