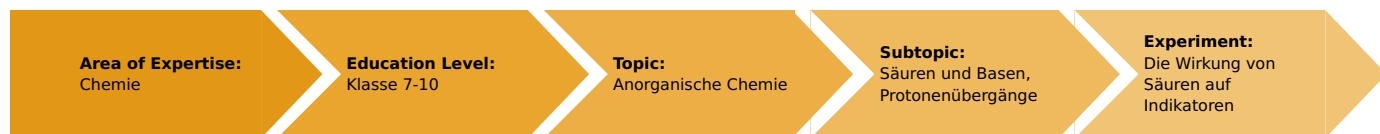


The effects of acids on indicators (Item No.: P7157300)

Curricular Relevance



Difficulty



Easy

Preparation Time



10 Minutes

Execution Time



10 Minutes

Recommended Group Size



2 Students

Additional Requirements:

Experiment Variations:

Keywords:

indicators, acid, effects of indicators

Task and equipment

Information for teachers

Learning objectives

- Indicators are colorants which indicate the presence of an acid through a change in colour.
- A large number of vegetable colorants can be found among these indicators.

Notes on set-up and procedure

Preparations

Prepare a 5% sulphuric acid and keep it ready to hand (3 ml of concentrated sulphuric acid and 100 ml of water).

Prepare a 5% hydrochloric acid and keep it ready to hand (13 ml of concentrated hydrochloric acid and 100 ml of water)

Prepare a 10% acetic acid in the same way (11 ml of glacial acetic acid and 100 ml of water).

However, it is not necessary to keep the exact concentration levels.

Preparation of the beetroot colorant

Pour hot water over small pieces of beetroot, allow it to stand for 10 minutes and filter it out.

Preparation of the red cabbage colorant and the flower colorant

Put some small pieces of red cabbage or some flower petals together with 4 spatulas of sand and 10 ml of raw alcohol into a mortar and grind them for about 5 minutes. Add another 5 ml of raw alcohol and continue grinding for 3 minutes. Filter everything out.

Remarks on the students' experiments

Make sure that the indicators are added to the different acids in the correct order. Once more draw the students' attention to the proper way of handling acids.



Hazard and Precautionary statements

Sulphuric acid:

- H314: Causes severe skin burns and eye damage.
H290: May be corrosive to metals.
P280: Wear protective gloves/protective clothing/eye protection/face protection.
P301 + P330 + P331: IF SWALLOWED: rinse mouth. Do NOT induce vomiting.
P309: IF exposed or if you feel unwell:
P310: Immediately call a POISON CENTER or doctor/physician.
P305 + P351 + P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Hydrochloric acid:

- H314: Causes severe skin burns and eye damage.
H335: May cause respiratory irritation.
H290: May be corrosive to metals.
P280: Wear protective gloves and eye/face protection.
P301 + P330 + P331: IF SWALLOWED: rinse mouth. Do NOT induce vomiting.
P309 + P310: IF exposed or if you feel unwell: Immediately call a POISON CENTER or doctor/physician.
P305 + P351 + P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Acetic acid:

- H226: Flammable liquid and vapour.
H314: Causes severe skin burns and eye damage.
P280: Wear protective gloves/protective clothing/eye protection/face protection.
P301 + P330 + P331: IF SWALLOWED: rinse mouth. Do NOT induce vomiting.
P307 + P310: IF exposed: Immediately call a POISON CENTER or doctor/physician.
P305 + P351 + P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Hazards

- Acids are highly corrosive. Put on protective glasses!

Notes

The prepared vegetable colorants must be stored in a cool and dark environment in order to prevent them from losing their indicating effect.

Remarks on the method

Since in the students' imagination the alkali concept is antinomically linked to the acid concept, the indicator concept can already be extended to the alkalis at this stage. The behaviour of this class of substances with regards to vegetable indicators and synthetic indicators will be the central theme in the next experiment.

Waste disposal

- Put the acids with the indicator solutions into the collecting tank for acids and alkalis.

The effects of acids on indicators (Item No.: P7157300)

Task and equipment

Task

How do acids act on indicators?

Study the effect of different acids on vegetable colorants and flower colorants.



Equipment



Position No.	Material	Order No.	Quantity
1	Protecting glasses, clear glass	39316-00	1
2	Test tube rack for 12 tubes, holes d= 22 mm, wood	37686-10	1
3	Wash bottle, 250 ml, plastic	33930-00	1
4	Labor pencil, waterproof	38711-00	1
5	Pipette with rubber bulb	64701-00	3
6	Pipette with rubber bulb, long	64821-00	1
7	Test tube, 18x188 mm, 10 pcs	37658-03	(12)
	Hydrochloric acid 37 %, 1000 ml	30214-70	1
	Sulphuric acid, 95-98% 500 ml	30219-50	1
	Acetic acid 99...100%, 500 ml	31301-50	1
	Water, distilled, 5 l	31246-81	1
Additional material			
	Beetroot colorant		
	Flower colorant		
	Red cabbage colorant		

Set-up and procedure

Set-up

Hazards

- Acids are highly corrosive. Put on protective glasses!



Set-up

Mark the 12 test tubes in such a way that there are always 3 test tubes with the same figure written on them (3x1, 3x2, 3x3, 3x4) and put the test tubes next to each other into the test tube rack (Fig. 1).



Fig. 1

Mark three pipettes with "sulphuric acid", "hydrochloric acid" and "acetic acid" (Fig. 2).



Fig. 2

Procedure

Fill the three test tubes marked with the figure 1 with hydrochloric acid, sulphuric acid and acetic acid respectively (filling height approximately 3 cm in each test tube). Use the corresponding pipette for each acid. Proceed in the same way with the three test tubes marked with the figure 2 and 3. Use the corresponding pipette for each acid (Fig. 3).



Fig. 3

Rinse the pipettes thoroughly with distilled water. Then fill some distilled water in the three test tubes marked with the figure 4 (filling height approximately 3 cm in each test tube).

Suck some of the beetroot colorant into the long pipette (Fig. 4) and let it drop into the first test tube marked with the figure 1 (Fig. 5) and then also into the first test tubes marked with the figures 2 to 4.

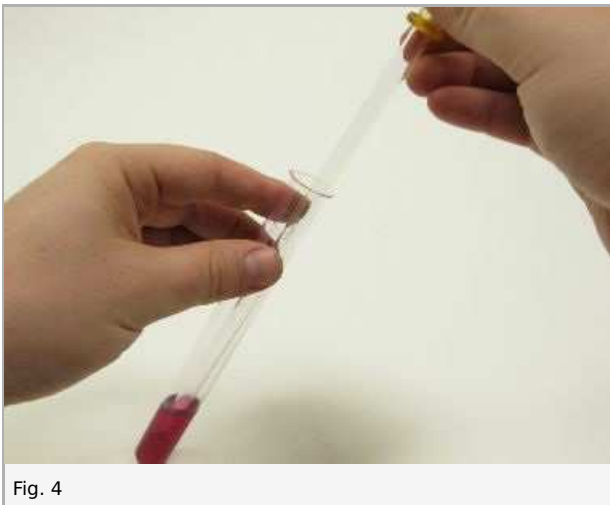


Fig. 4



Fig. 5

Take a second pipette and let some of the red cabbage colorant drop into the second test tube 1 to 4 and then also some flower colorant into the third test tube 1 to 4.

Waste disposal

- Put the acids with the indicator solutions into the collecting tank for acids and alkalis.

Report: The effects of acids on indicators

Result - Observations

write down your observations.

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Result - Table 1

Note the observed colours in the table.

Colorant	Hydrochloric acid	Sulphuric acid	Acetic acid	Distilled water
Beetroot	1	1	1	1
Red cabbage	1	1	1	1
Flower petals	1	1	1	1

Evaluation - Question 1

draw the conclusions from your observations.

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Evaluation - Question 2

what other class of substances could perhaps be identified in the same way?

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Evaluation - Question 3

Explain the term "indicator".

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