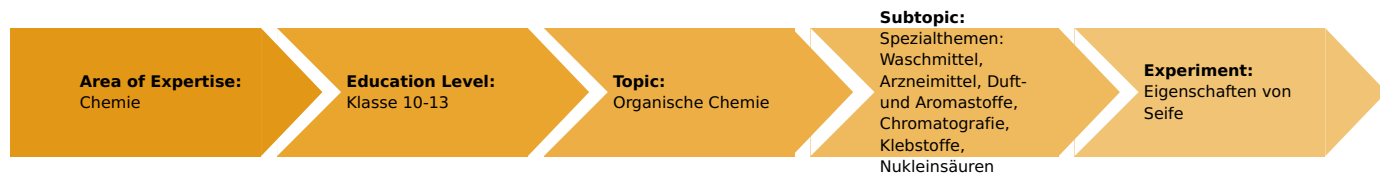


The properties of soap (Item No.: P7173400)

Curricular Relevance



Difficulty



Easy

Preparation Time



10 Minutes

Execution Time



10 Minutes

Recommended Group Size



2 Students

Additional Requirements:

Experiment Variations:

Keywords:

soaps, material property of soaps

Task and equipment

Information for teachers

Learning objectives

- Soaps can dissolve unipolar substances and so detach them from materials.
- Soaps form alkaline aqueous solutions. They react with other salt solutions (with the exception of alkali salts) forming insoluble compounds, the so-called lime soaps (calcium soaps).

Notes on setup and procedure

Preparation:

Washing soap must be used for this experiment, hand soap is less suitable. The soap solution can be prepared from the washing soap used. Other vegetable oils can be used in place of olive oil.

Remarks on the students experiments:

Ensure that the ends of the wool hang out of the test tubes, so that the wool can be removed for examination. The water which is added to the soap solution coloured with indicator must not be basic, i.e. not tap water.



Hazards and precautionary statements

Calcium hydroxide:

- H315: Causes skin irritation.
 H318: Causes serious eye damage.
 H335: May cause respiratory irritation.
 P261: Avoid breathing dust/fume/gas/mist/vapours/spray.
 P280: Wear protective gloves/protective clothing/eye protection/face protection.
 P305 + P351 + P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do - continue rinsing.

Ethanol:

H225: Highly flammable liquid and vapour.

P210: Keep away from heat/sparks/open flames/hot surfaces – No smoking.

Silver nitrate:

H272: May intensify fire; oxidizer.

H314: Causes severe skin burns and eye damage.

H410: Very toxic to aquatic life with long lasting effects.

P273: Avoid release to the environment.

P280: Wear protective gloves/protective clothing/eye protection/face protection.

P301 + P330 + P331: IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.

P305 + P351 + P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do – continue rinsing.

P309 + P310: IF exposed or you feel unwell: Immediately call a POISON CENTER or doctor/physician.

Hazards

- Calcium hydroxide solution is corrosive!
- Wear protective glasses!
- Silver nitrate causes severe skin burns. Wear protective gloves! Wash off splashes on the skin with copious water!

Remarks on the method

In a parallel experiment a dilute potassium chloride solution could also be added to soap, to demonstrate that alkaline salts do not form lime soaps. The experiment is suitable for sharing the work in groups with exchange of the experimental results.

Waste disposal

- Pour the contents of the test tubes 1 to 4 and of the beaker down the drain.
- Pour the contents of the test tubes 5 to 7 in the container for acidic and alkali waste.

The properties of soap (Item No.: P7173400)

Task and equipment

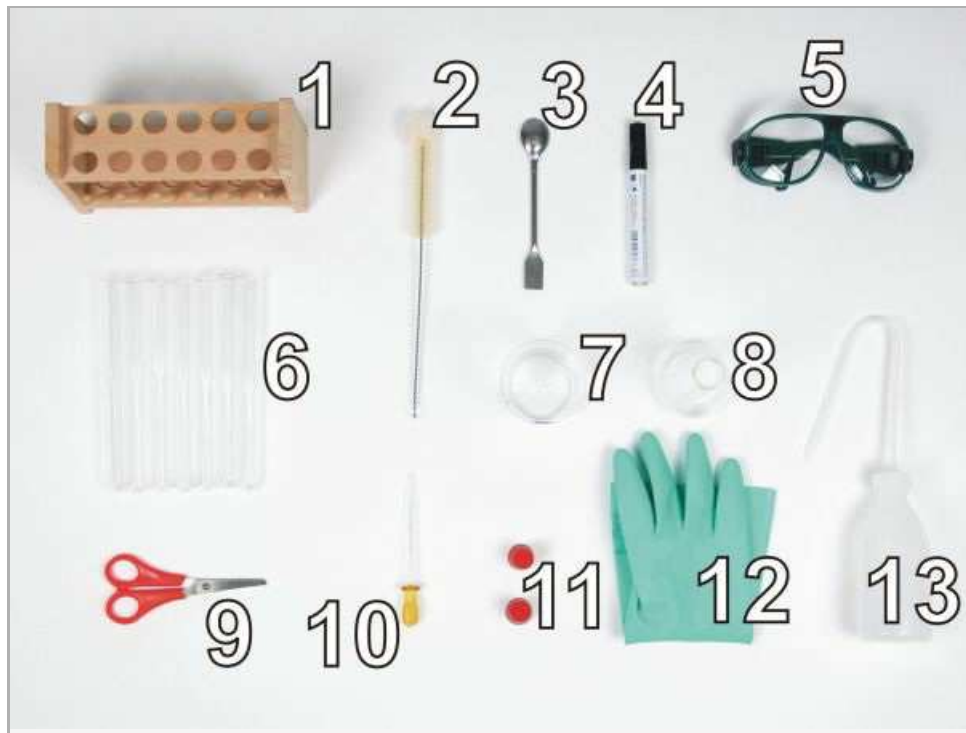
Task

What effects do soaps have?

Examine the behaviour of soaps towards other substances.



Equipment



Position No.	Material	Order No.	Quantity
1	Test tube rack for 12 tubes, holes d= 22 mm, wood	37686-10	1
2	Test tube brush w. wool tip,d25mm	38762-00	1
3	Spoon, special steel	33398-00	1
4	Labor pencil, waterproof	38711-00	1
5	Protecting glasses, clear glass	39316-00	1
6	Test tube, 180x18 mm,100pcs	37658-10	(7)
7	Glass beaker DURAN®, short, 150 ml	36012-00	1
8	Graduated cylinder, 10 ml, plastic	36636-00	1
9	Scissors, l = 110 mm, straight, point blunt	64616-00	1
10	Pipette with rubber bulb	64701-00	1
11	Rubber stopper, d=22/17 mm, without hole	39255-00	2
12	Rubber gloves, size S (7)	39325-00	1
13	Wash bottle, 250 ml, plastic	33930-00	1
	Ethanol extra pure ab.95% 1000 ml	30008-70	1
	Charcoal powder 250 g	30087-25	1
	Olive oil,pure 100 ml	30177-10	1
	Soap solu.(Boutron-Boudet) 250 ml	30221-25	1
	Silver nitrate solution 5% 100 ml	30223-10	1
	Water, distilled 5 l	31246-81	1
	Calcium hydroxide solution 1000ml	31458-70	1
	Magnesium chloride 500 g	31540-50	1
	Phenolphthalein, 0,5% soution in ethanol, 100 ml	31715-10	1
Additional material			
	Curd soap		
	Woolen thread		

Set-up and procedure

Set-up

Hazards

- Limewater is corrosive!
- Wear protective glasses!
- Silver nitrate causes severe skin burns. Wear protective gloves! Wash off splashes on the skin with copious water!



Setup

Number the test tubes from 1 to 7 and place them next to each other in the test tube rack.

Put about 1 ml of soap solution in the test tubes 1 and 2 (Fig. 1), add 2 ml of water and mix the liquids by shaking gently.



Fig. 1

Fill test tubes 3 and 4 up to the same height with water.

Put about 5 ml of soap solution in the test tubes 5 to 7 (Fig. 2).



Fig. 2

Procedure

Add 2 drops of olive oil to test tubes 1 and 3 (Fig. 3). Stopper the test tubes and shake them vigorously (Fig. 4). Put the test tubes back in the test tube rack and measure the time it takes for them to unmix.



Fig. 3



Fig. 4

Cut off two approximately 25 cm long pieces of the woolen yarn and rub charcoal powder onto one end (Fig. 5). Dip one of these ends into test tube 2, the other into test tube 4. Move the ends back and forth a few times, then shake the contents vigorously (Fig. 6).

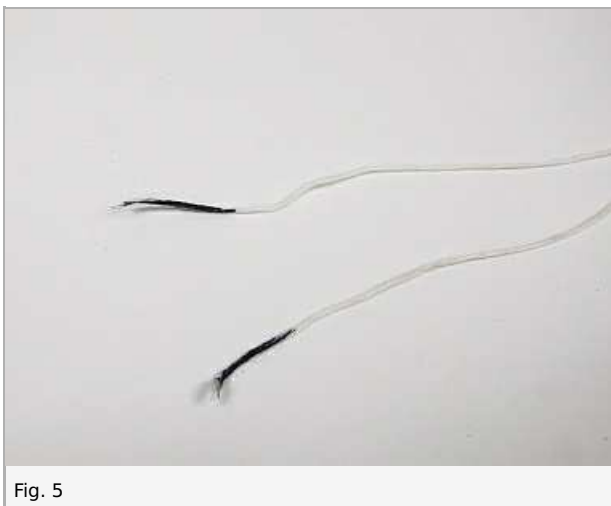


Fig. 5

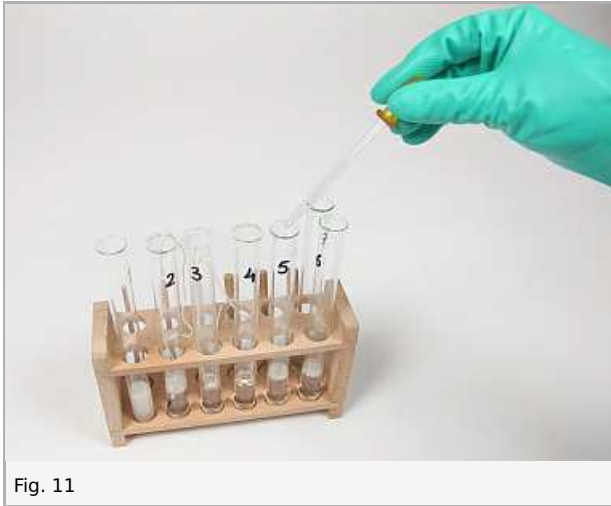


Fig. 6

Put half a spoonful of curd soap into the beaker, add 10 ml of ethanol and add a few drops of phenolphthalein solution (Fig. 7 to 9). Dilute with distilled water until a change occurs (Fig. 10).



Drop a little limewater in the soap solution in test tube 5, stopper the test tube and shake it vigorously (Fig. 11+12).



Put a few drops of magnesium chloride solution in test tube 6 and a few drops of silver nitrate in test tube 7. Stopper the test tubes and shake them vigorously.

Waste disposal

- Pour the contents of the test tubes 1 to 4 and the beaker down the drain.
- Pour the contents of test tubes 5 to 7 in the container for acidic and alkali waste.

Report: The properties of soap

Result - Observations

Note your observations on test tube 1 to 7 and the beaker.

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Evaluation - Question 1

Draw conclusions from your observations.

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Evaluation - Question 2

Summarize the properties of soap which result from these results.

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Evaluation - Question 3

Why must water softeners be added to washing powders in areas with very hard water?

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