

Teaching module washing

Worksheets

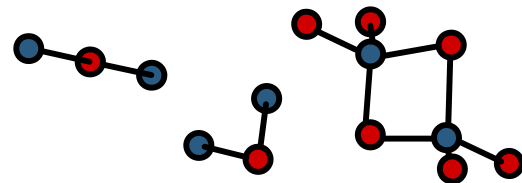


Worksheets

3rd-5th grade

Concept

These worksheets are part of a one-week research course for elementary school children as part of the "Forscherwelt" educational initiative. The didactic concept and program were developed under the leadership of Prof. Dr. Katrin Sommer, Chair of Didactics of Chemistry at the Ruhr University Bochum, with the support of experts from Henkel. The experiments are suitable for children in their third or fourth year of school.



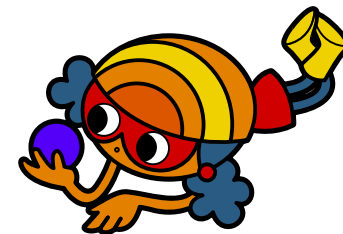
Lessons

- What washes in detergents?
- Water hardness
- Washed too hot?
- Cotton and wool



What washes in detergents?

Effect of surfactants



No detergent without surfactants

Washing clothes is an integral part of everyday life. But what are detergents actually made of? How do they work?

Today you will learn about an important ingredient in laundry detergents.

Researchers call this ingredient "surfactant."

Surfactants work in much the same way as soap. They ensure that dirt stains can be washed out of a garment easily.

Surfactants are also the reason why a detergent foams.

Influence on surface tension

1. Fill a glass vessel with water and carefully place three thumbtacks flat on the water surface with the point facing upwards.
2. Using an eyedropper, drop 1-2 drops of liquid detergent into the water.
3. Observe what happens and write down what you see.



What washes in detergents?

Effect of surfactants

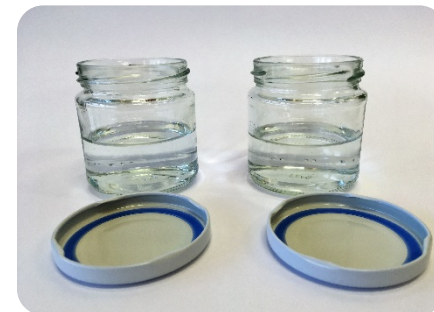


Dispersion of dirt

You get two glass jars with screw lids.

1. Fill them halfway with water.
2. Using a small spatula, add a small spatula tip of carbon black to both glasses.
3. Now drop two drops of surfactant into one of the two jars using a pipette.
4. Carefully close the jars with the screw caps and shake both jars for approx. 15 seconds.

Compare the glasses. What can you observe? Write it down here:



What washes in detergents?

Effect of surfactants

Wash out oil stains

Now you should test how well oil stains wash out.

1. From a dropper bottle, drip four drops of olive oil in the center of each piece of fabric you get.
2. Fill two screw-top jars halfway with warm water from the faucet. Drop 2 drops of detergent into one of the screw-top jars.
3. Put a piece of fabric in each of the jars and screw the lids on tightly.
4. Shake both screw-top jars for two minutes and then get out the two pieces of fabric. Briefly pat them dry with a piece of kitchen paper and hold them up to the light.



What did you notice?



A question of dosage

Hard water - soft water: why is it important?

Not all water is the same

When you do laundry, remember that the detergent ends up in the wastewater and thus in the environment. That's why it's important to use only as much detergent as is absolutely necessary.

The right amount depends on how "hard" the water is.

Hard water? What is it? First, we have to answer this question. To do this, you examine two water samples: sample A and sample B.

1. Take a pipette and drop 0.5 mL of sample A onto a tablespoon.
2. Hold the tablespoon over a tea light with a wooden clamp until the water has evaporated.
3. Now drop 0.5 mL of sample B onto a second tablespoon.
4. Also hold the second tablespoon over a tea light until the water has evaporated.
5. What do the two tablespoons look like when dry? Write down: _____



You are working with a burning tea light.
Make sure that you do not touch the flame with your fingers and that you do not hold anything flammable in the flame!



A question of dosage

Hard water – soft water: why is that important?

Detergent in soft and hard water

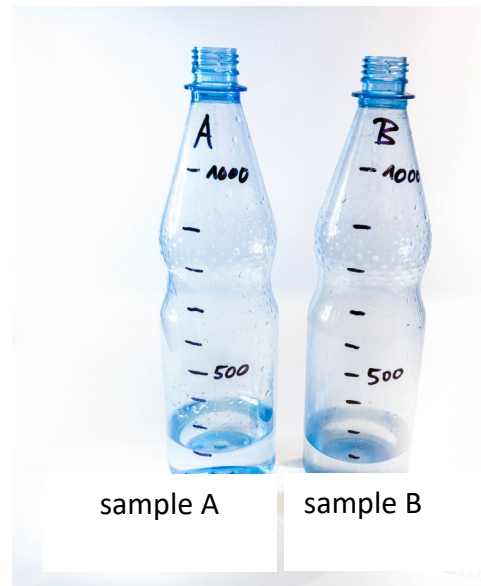
1. Pour 500 mL of water sample A into a large beaker
2. Add 8 mL of liquid detergent and stir the liquid with a glass rod for 5 minutes.
3. Repeat steps 1 and 2 with sample B.
4. Write down here what you observe:

Foam?

Work in 2 groups

- A) Group 1 examines sample A
- B) Group 2 examines sample B

1. Fill 200 mL of your water sample into a 1L plastic bottle.
2. Pour 1 mL of detergent into the bottle and close it tightly.
3. Shake the bottle vigorously for 30 seconds.
4. Compare your bottle with the bottle from the other group. What do you notice?



sample A

sample B



Washed too hot?

Clean laundry with cold water - is it possible?

Saving energy

A washing machine consumes electricity. The hotter the wash cycle, the higher the power consumption. This is not only expensive, but also not good for the environment. This is because electricity generation usually produces carbon dioxide (CO₂), which is a greenhouse gas.

It is good for the environment if we save electricity and wash our clothes with the coldest water possible.

But: Will the laundry get clean even with cold water? Give it a try.

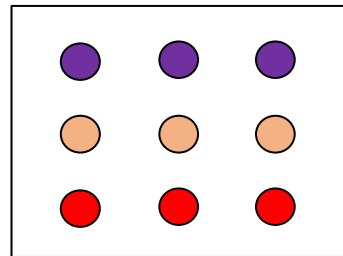
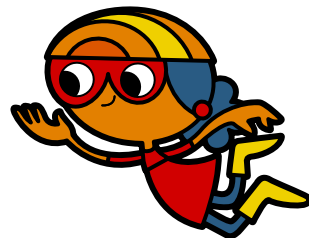
Preparation: Stain fabric

You are to smudge a white piece of cloth with beet juice, drinking chocolate and ketchup.

Note that

- each type of stain is applied to the piece of cloth a total of three times
- the stains do not touch each other

Label your fabric piece with your name.

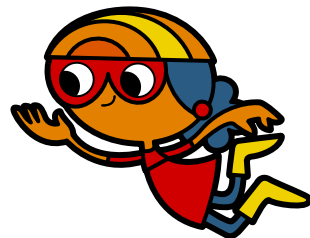


- 3 x 0,5 mL root beet juice
- 3 x 0,5 mL cacao
- 3 x a spatula tip ketchup



Washed too hot?

Clean laundry with cold water – is it possible?



Washing tests - divided into groups

Write the number of your wash experiment on your piece of fabric.

1. Pour 750mL of water at the correct temperature into a beaker together with a stirring fish. Add your piece of fabric and place the beaker on a magnetic heating stirrer.
2. Using a pipette, add 1mL of liquid detergent.
3. Choose a medium stirring speed and "wash" the fabric for 10 minutes.
4. Take out the piece of fabric, wring it out well.

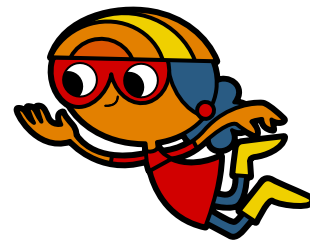
Test #	upm	time (min)	temperature (°C)	detergent (mL)	water (mL)
1	medium	10	10	1	750
2	medium	10	20	1	750
3	medium	10	30	1	750
4	medium	10	40	1	750
5	medium	10	50	1	750
6	medium	10	60	1	750

Attention hot water: Have an adult help you with experiments 5 and 6.



Washed too hot?

Clean laundry with cold water – is it possible?



Evaluation

1. Rate your washing result and enter it in the table below. Use smileys for this:



2. At the end, compare your washing results with those of your table mates.

Stain	Test No. 1	Test No. 2	Test No. 3	Test No. 4	Test No. 5	Test No. 6
Beet root						
Cocoa						
Ketchup						



Cotton and wool

Differences

What happens to cotton and wool in hot washing cycles?

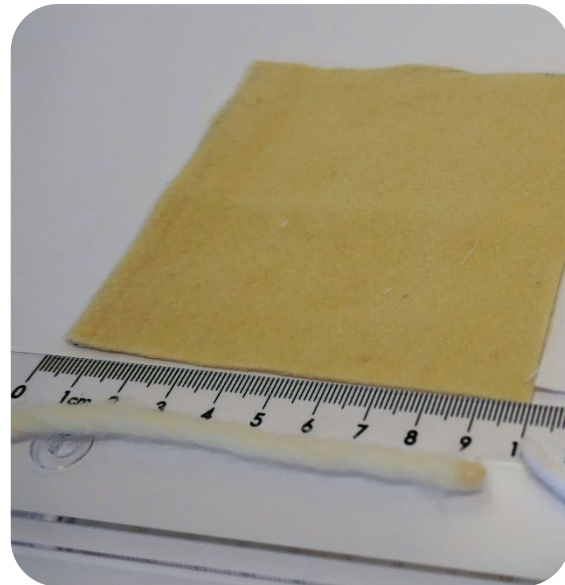
You need:

- pieces of fabric (cotton and wool), which are exactly 10x10 cm in size
- thread, which is exactly 10 cm long
- detergent
- hand washing machine (or a washing bowl)
- water (approx. 60°C)
- thermometer
- Stopwatch

Attention hot water! Only work under supervision of an adult!

Instruction

1. Put the piece of fabric and thread in the hand washing machine.
2. Add 1 L of (approx. 60°C) hot water.
3. Add 6 g of detergent
4. Wash everything for 15 minutes, turning the drum about 50 times per minute.
5. At the end, take the piece of fabric and the thread out of the washing machine and wring them out.



Cotton and wool

Differences

Dyeing cotton and wool

How well do the two fabrics dye?

You need:

- Cotton and wool threads
- Cotton and wool fabric piece
- 2 beakers with red colored lemonade

What differences can you observe between cotton and wool?

Instruction

1. Take a cotton thread and a piece of cotton fabric and put both into one of the beakers.
2. Now take the woolen thread and the piece of woolen fabric and put both into the other beaker.
3. Fill up the beakers with lemonade.
4. Stir both beakers over and over for 10 minutes.
5. After 10 minutes, take everything out of the jars and give the pieces a quick rinse under the faucet.
6. Pat threads and fabric pieces dry well with a paper towel.

