



How many

Minerals

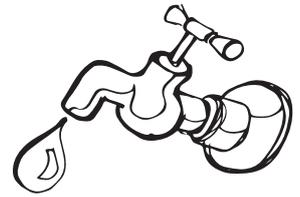
are found in the ?

SMART KIDS LAB

Step by Step

SMART KIDS LAB

How clean is the air you breathe? Is swimming water the same as drinking water? How many microbes live in the soil beneath your feet? And what does it all mean? DISCOVER how healthy your neighbourhood is and what you can do to improve it. SMART KIDS LAB lets you examine the water, noise, air, earth and light around you with homemade measuring instruments. On the smarkidslab.nl website, you'll find out how to make the measuring instruments (meters) and how you can GET STARTED.

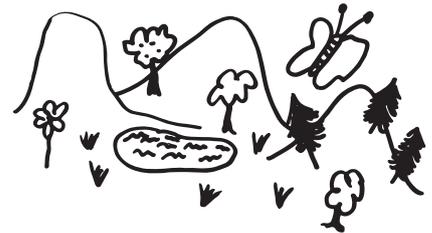


WHAT'S IN THE WATER? AND WHAT'S IN THE SOIL?

YOU'LL BE INVESTIGATING HOW MANY MINERALS ARE IN THE WATER AND/OR IN THE SOIL. Minerals are substances like calcium, magnesium, sodium, carbonates and sulfates. These minerals are the building materials for your BODY. They are also important for organisms like the aquatic plants that help keep waterways healthy. But you can have TOO MUCH of a good thing. Water containing too many minerals can be unhealthy and, if it's high in sulfates, you can even get diarrhea from it. If there are too many of the wrong minerals in the soil (perhaps from too much cow manure), it can affect the health of the environment. For example, coastal ecosystems like dunes and heathlands are affected when grass encroaches and replaces other plants. Or did you think grass only grew in your backyard? Or the park? Grass, grass, everywhere... BORING!

HOW DOES IT WORK?

It all begins with the QUESTION: What do you want to measure? Do you already know? GREAT! Now you can GET GOING.



STEP 1.

You start by making the MEASURING INSTRUMENT. *What you'll need: [Smart Kids Lab / making meters](#). There you'll find all the information you need to get started.



DIFFICULT METER! Ask an ADULT to help you.

STEP 2.

Now it's time to go do RESEARCH and experiment. Before you start, think about what you want to investigate in your area and how to go about doing it. Do you want to find out where the most mineral-rich water is? You could, for example, compare ditch water and rainwater with tap water. Or water from your bath (full of SWEAT!) with different brands of bottled mineral water.

*What you'll need: the [Smart Kids Lab / experiments](#) worksheet. This explains how to use your homemade meter to collect data.

STEP 3.

Collect the measurement DATA on the Smart Kids Lab worksheet. *What you'll need: the [Smart Kids Lab / experiments](#) worksheet. You can record your measurements here.

STEP 4.

Go grab the COMPARE-O-METER so you can compare your measurement data to that of others. You'll also find a lot of interesting information here. *For this you'll need: [Smart Kids Lab / compare-o-meter](#) worksheet.

STEP 5.

Take a picture of your measurement data and put it on the GREAT DATA MAP. You can find it at smarkidslab.nl.

*What you'll need: You can take a photo with a phone or digital camera. THE GREAT DATA MAP can be found at smarkidslab.nl (in the menu bar).



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Making Sense



waag society



Rijksinstituut voor Volksgezondheid en Milieu
Ministerie van Volksgezondheid, Welzijn en Sport



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SMART KIDS LAB compare-o-meter



COMPARE YOUR DATA

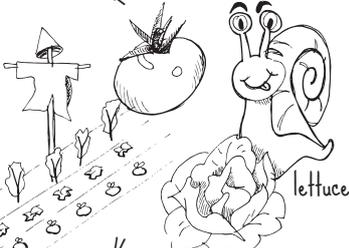
A LOT OF MINERALS

MINERALS are often found in water: these are substances such as calcium, magnesium, sodium, carbonates and sulphates. They're the building materials for your body!

Too many minerals in the water? Then it's not healthy to drink. Even cows can get diarrhea from it!



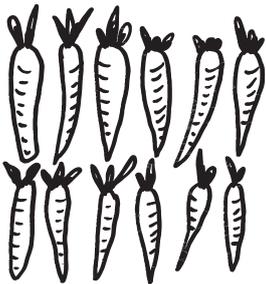
Tomatoes



lettuce

Vegetables don't grow as well if the water contains a lot of salts.

KITCHEN GARDEN

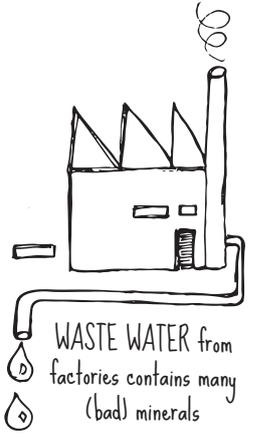


Too many of the wrong minerals (like nitrates from over-fertilization) can affect BIODIVERSITY. Coastal ecosystems like dunes and heathlands are affected when grass replaces the other plants. Imagine if you could ONLY grow carrots in your vegetable garden? And in your backyard too. And in the park ... and the forest. Carrots everywhere!



sea water

There are a lot of minerals and salts in seawater. You can taste it!



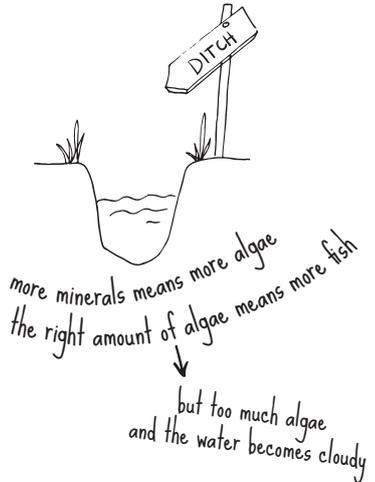
WASTE WATER from factories contains many (bad) minerals

QUITE A FEW MINERALS



drinking water

tap water



DITCH

more minerals means more algae
the right amount of algae means more fish
but too much algae and the water becomes cloudy



RAINWATER
few minerals

distilled water

contains no minerals: Not healthy to drink and not very tasty either (minerals are what give water its flavour and are good for you).

WAY TOO FEW MINERALS



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SMART KIDS LAB making Meters

DISCOVER HOW HEALTHY YOUR NEIGHBORHOOD IS AND WHAT YOU CAN DO TO IMPROVE IT!

In almost all water, you can find different types of MINERALS. Salt, for instance, is a mineral and the sea is full of it. Minerals are also important for our bodies to function correctly and for plants to grow. However, not all minerals are healthy. This is especially true when we get too much. Nitrate, for example, isn't great for us, but ends up in our drinking water through runoff from agricultural fertilizers.

Make a MINERAL METER and measure the amount of minerals in... drinking water or bath water or even toilet water!



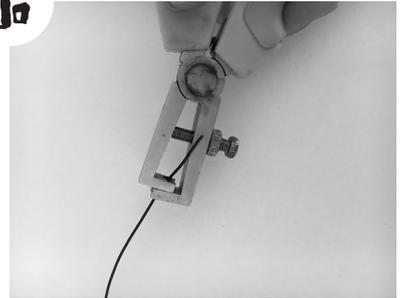
WHAT DO YOU NEED?

- VU meter
- Watch battery (LR44)
- Thin iron wire
- Thin green garden / electrical wire
- 3mm plywood + laser cutter (cardboard works, too!)
- Cable ties
- Ruler
- Wire strippers

PREPARATION: With an ADULT, make the wooden board with the holes and notches in it as shown in the pictures below. This can be done with a laser cutting machine if you have a Fablab near you. Download the files on smarkidslab.nl

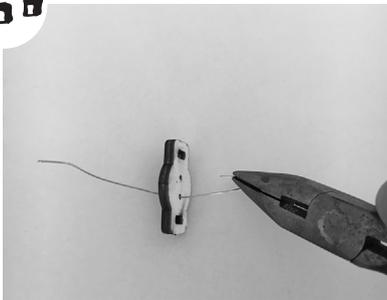
TIP! You can also draw or print the pattern & cut it out of cardboard!

1.



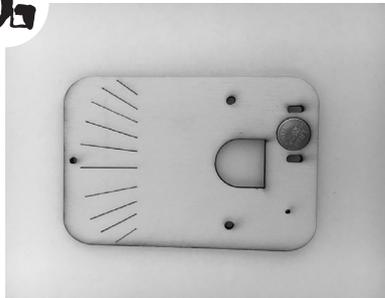
Cut 1 iron wire to 8.5 cm, 1 green wire to 18 cm, and 1 green wire to 20 cm. On the long green wire, strip 2.5 centimeters and on the short wire, strip 1.5 cm. On the other side, strip both of the wires exactly the same amount (5 mm, for example).

2.



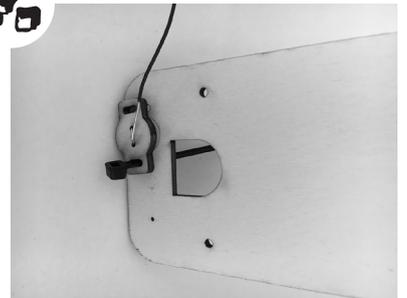
Run the iron wire through one of the round holes in one of the battery holders. Bend it with a pair of pliers a little so that the end can pass through the other hole (see above). Bend the tip inwards with a pliers. Do the same with the long green wire.

3.



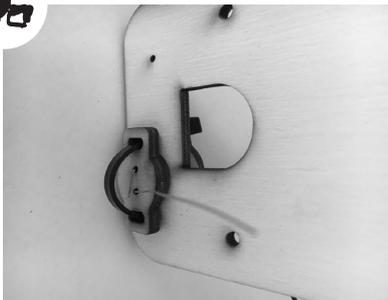
Grab the board and push the watch battery (with the flat side up) into the round hole.

4.



Now, turn over the board and place the battery holder you fitted with the green wire over the battery. Run the cable tie through the long, oval-shaped holes in both the battery holder and the board.

5.



Place the battery holder you fitted with the iron wire onto the battery on the front side of the board. Feed the cable tie through both holes and out through the back. **WATCH OUT:** The smooth side of the cable tie must face outwards. Attach it at the back and cut off the piece that sticks out.

LOOK ON THE BACK FOR STEPS 6, 7, 8 AND 9





How many

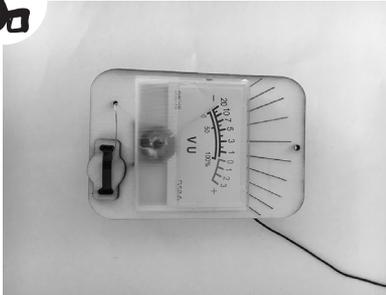
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SMART KIDS LAB making Meters

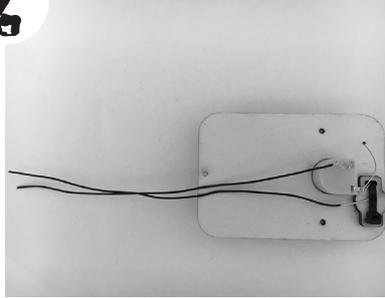
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6.



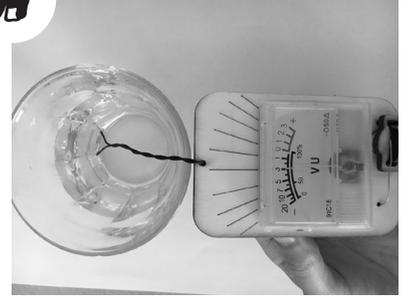
Push the VU meter into the board and run the iron wire on the front side through the small hole on the lower left side.

7.



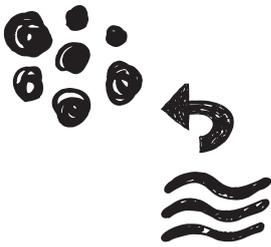
Turn the board over. On the back of the VU meter is a + and a -. Attach the iron wire to the + by bending the wire with pliers. Now take the short green wire that you haven't used yet and attach it to the -. **CAUTION:** Make sure the wires do NOT touch each other!

8.



Grab the green wires and twist them together to make one green wire. Push the twisted wires through the hole at the top. Bend the ends away from each other in a "Y" shape so that they don't touch.

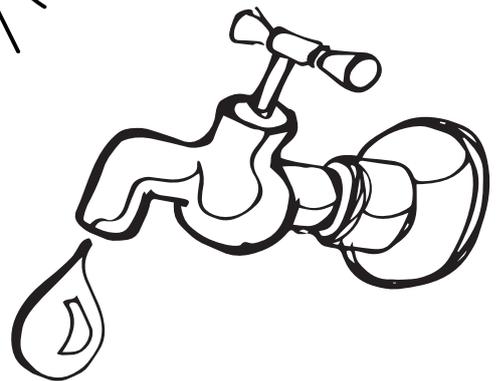
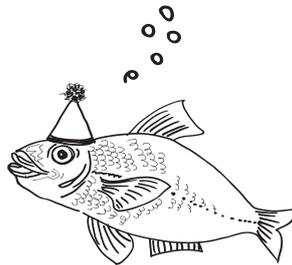
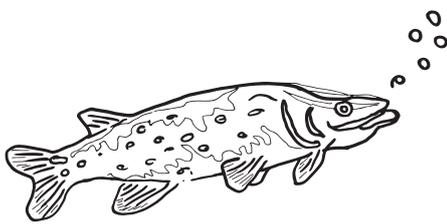
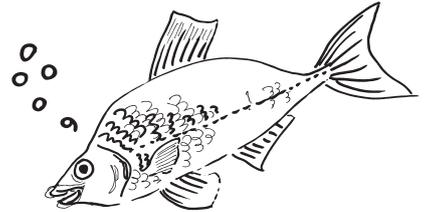
9.



Your MINERAL METER is finished! You can go test it!

TIP

Put the wires in a glass of drinking water, add some salt and see how it affects the meter reading. The further the pointer moves along the VU meter, the more minerals are in the water.



SMART KIDS LAB.NL

making Meters ➔ experiments

