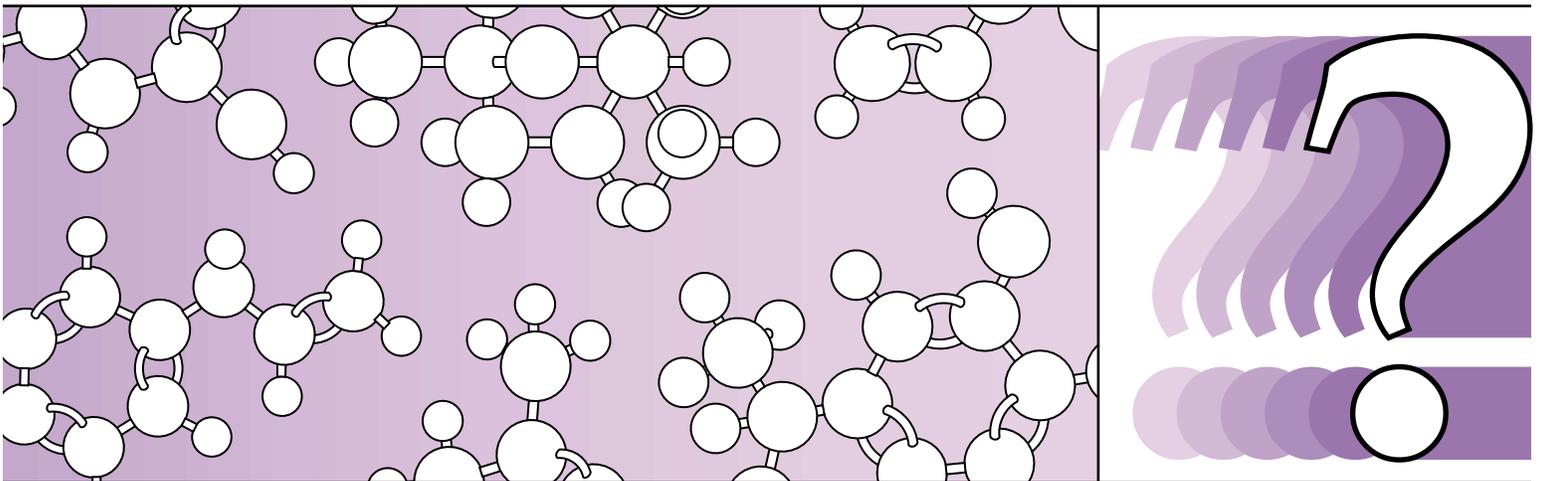


The Pfizer Foundation Biochemistry

Discovery Lab

How do water filters work?



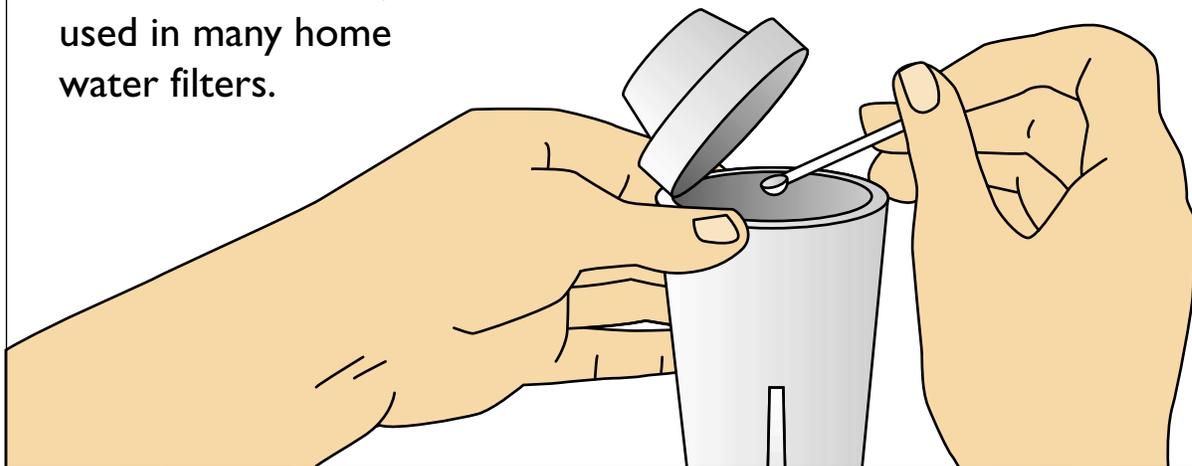
Do you have a water filter at home, school or work?

**Lots of people drink filtered water.
How does a filter work?**

Do an experiment to find out.

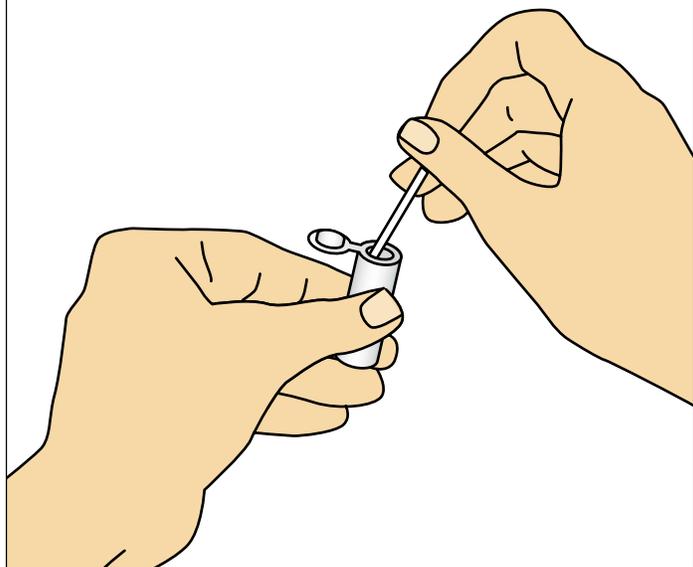
Take a scoop of grains from the water filter.

This is a Brita filter,
used in many home
water filters.

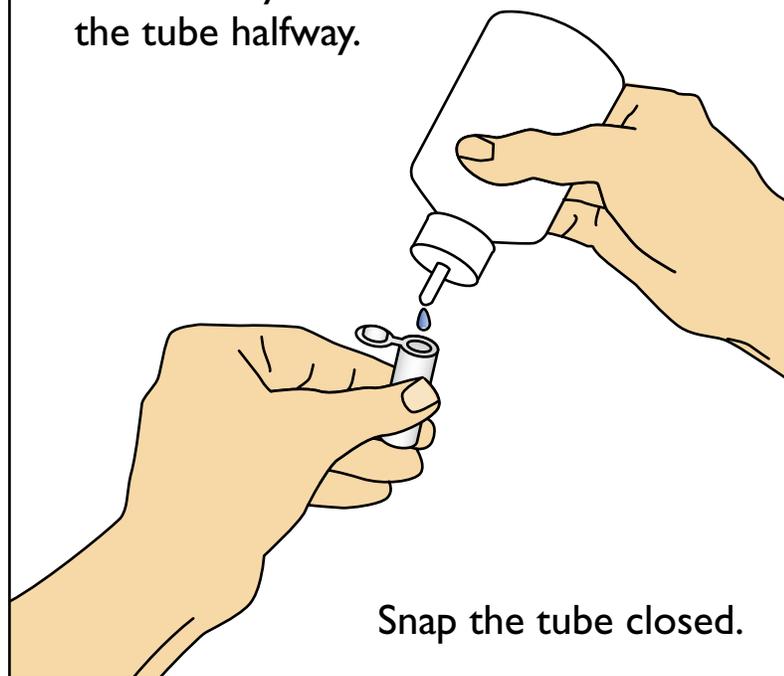


What do the
filter grains
look like?

Put a full scoop of the
filter grains in a tube.



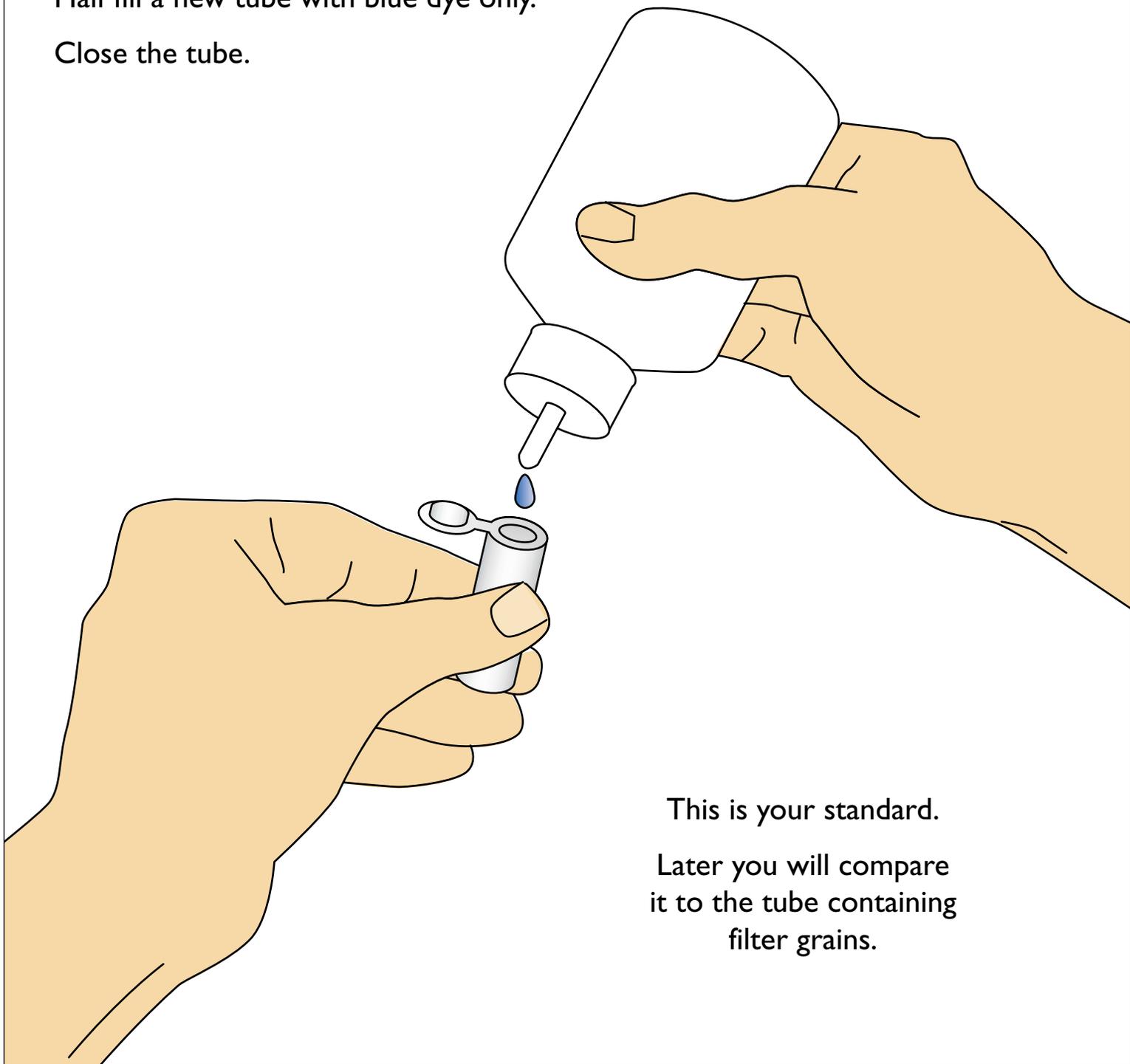
Add blue dye to fill
the tube halfway.



Snap the tube closed.

Half fill a new tube with blue dye only.

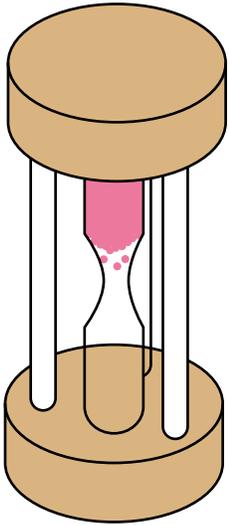
Close the tube.



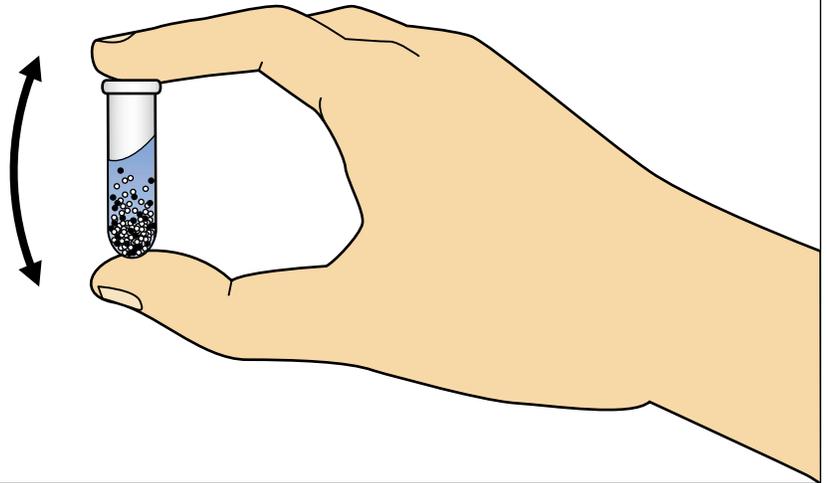
This is your standard.

Later you will compare
it to the tube containing
filter grains.

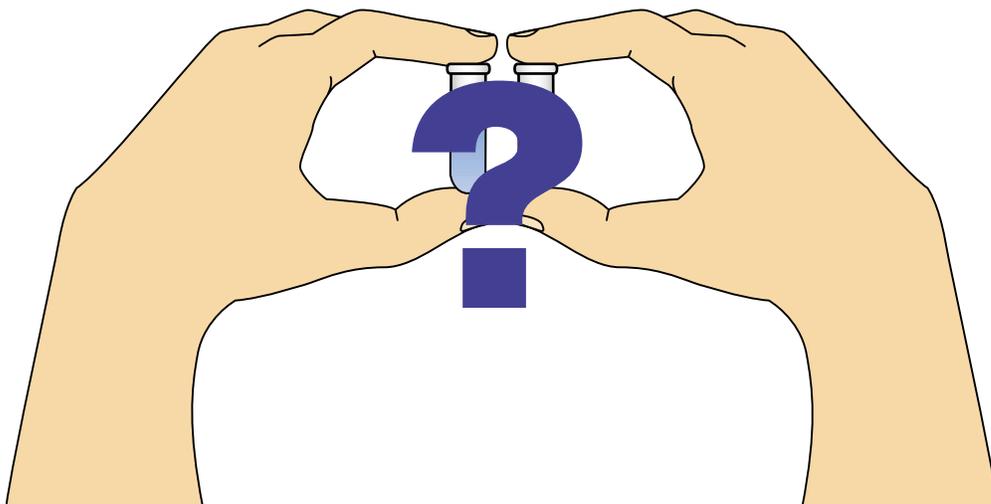
Start the timer.



Shake both tubes hard until the timer is done.



Compare the two tubes.

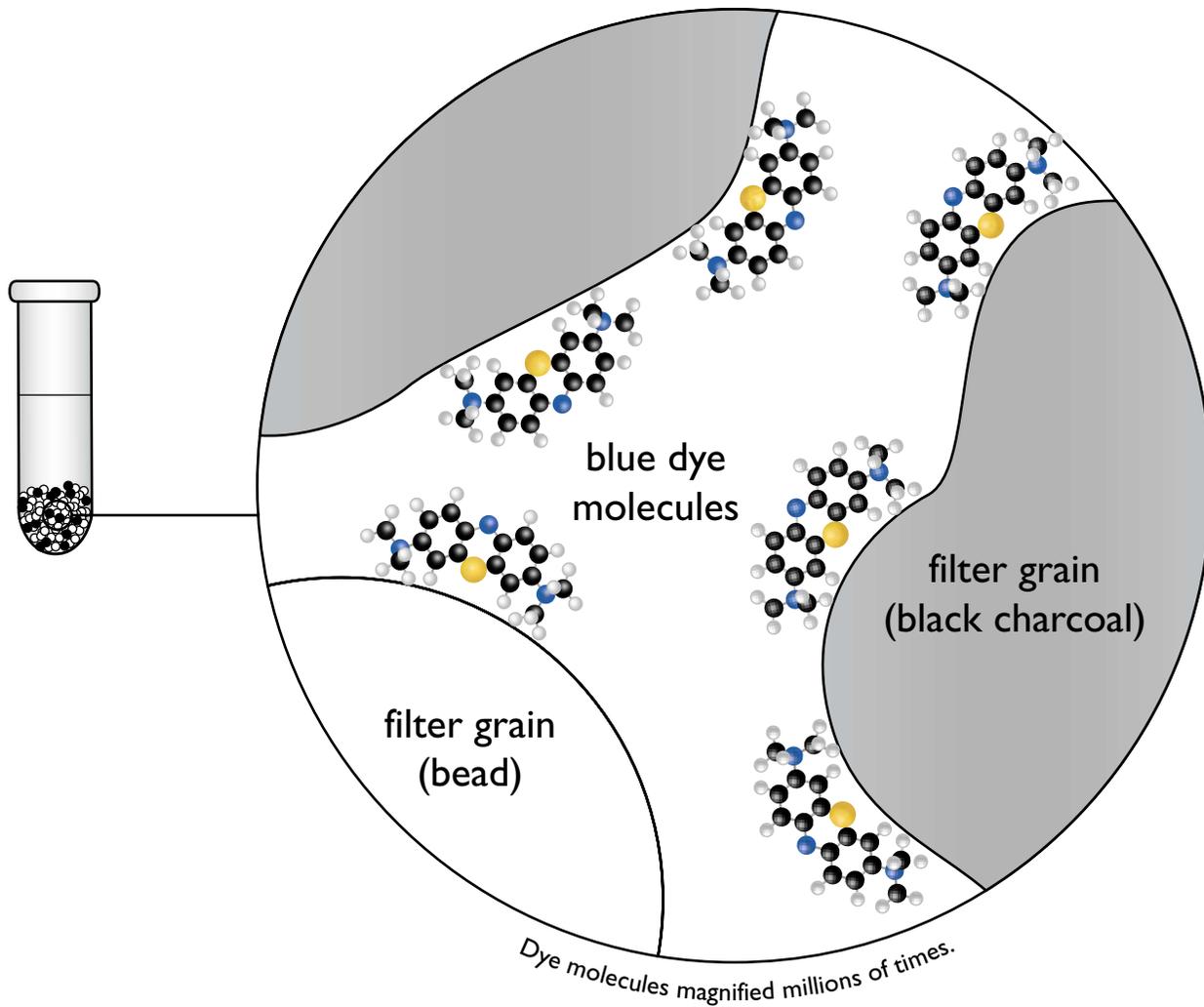


What have the
filter grains done
to the dye?

Where has the
dye gone?

How do the filter grains work?

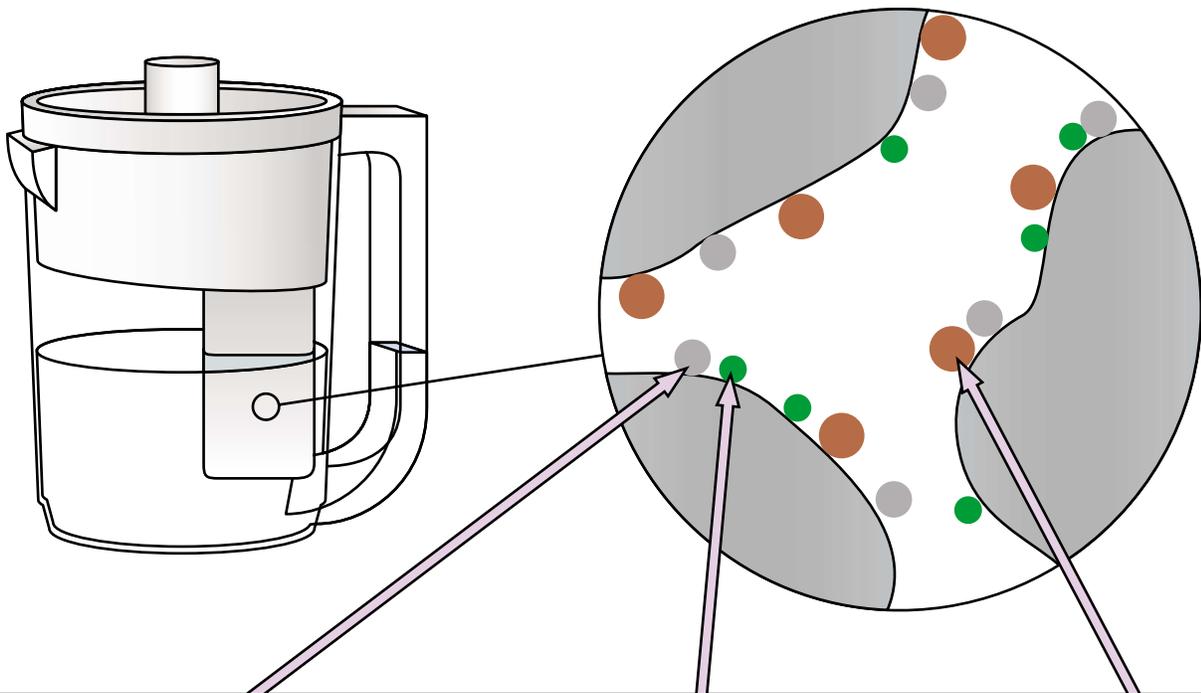
The dye molecules stick to the filter grains:



Look at the round beads in your experiment.
You may be able to see the blue dye stuck to them.

What happens in a home water filter?

In our home water filters, the filter grains remove unwanted atoms from tap water. Like the dye in your experiment, the atoms stick to the filter grains:



calcium or magnesium atom

Calcium and magnesium are natural, harmless atoms in water, but they cause blockage in pipes.

chlorine atom

Chlorine is added to drinking water to kill harmful bacteria. Some people don't like its taste.

lead or copper atom

Lead and copper leach from old pipes and are toxic in large amounts.

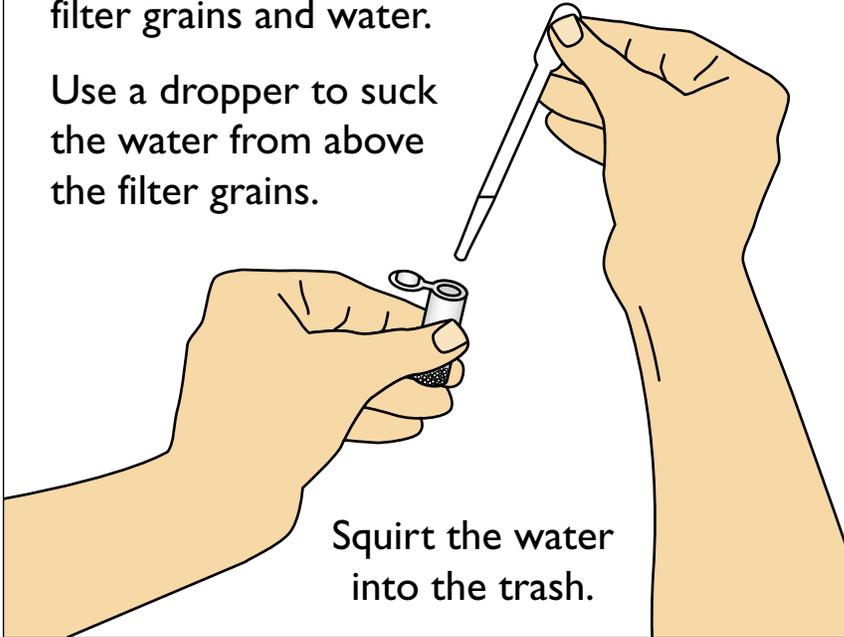
Although you could see the dye in your experiment, you can't see these atoms in tap water — they are too small and are not colored like the dye.

How much dye can the filter grains remove?

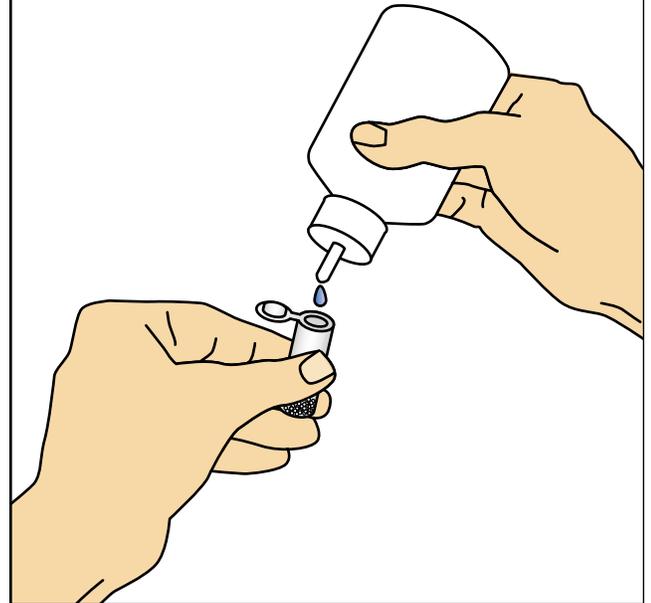
Open your tube containing filter grains and water.

Use a dropper to suck the water from above the filter grains.

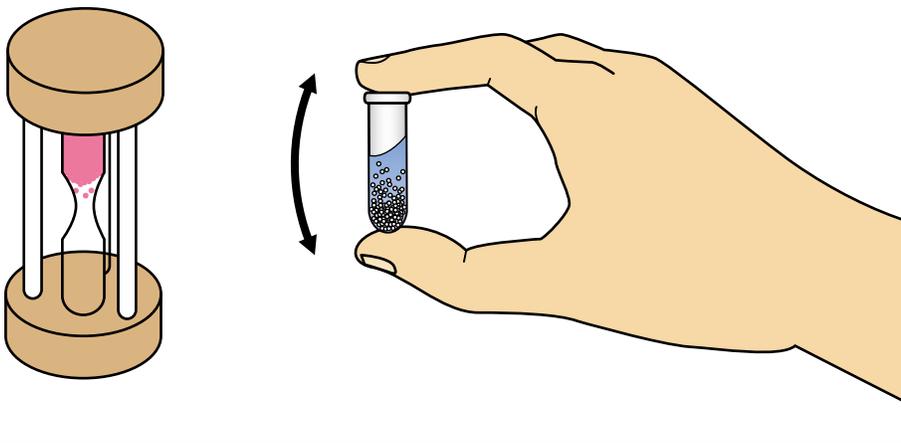
Squirt the water into the trash.



Add more dye to the grains.



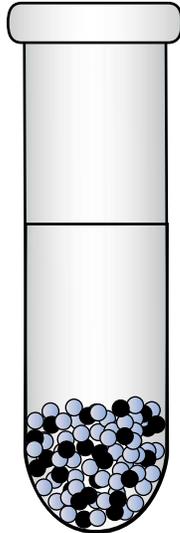
Start the timer and shake the tube again.



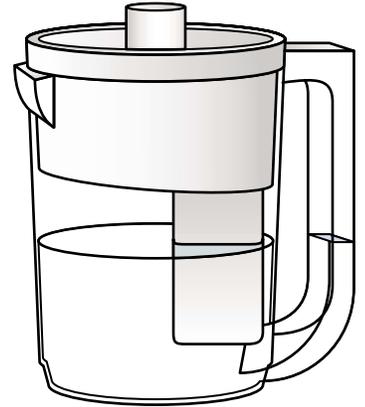
Do the grains remove these dye molecules as well?

The filter grains in your experiment should have removed more dye molecules from the water.

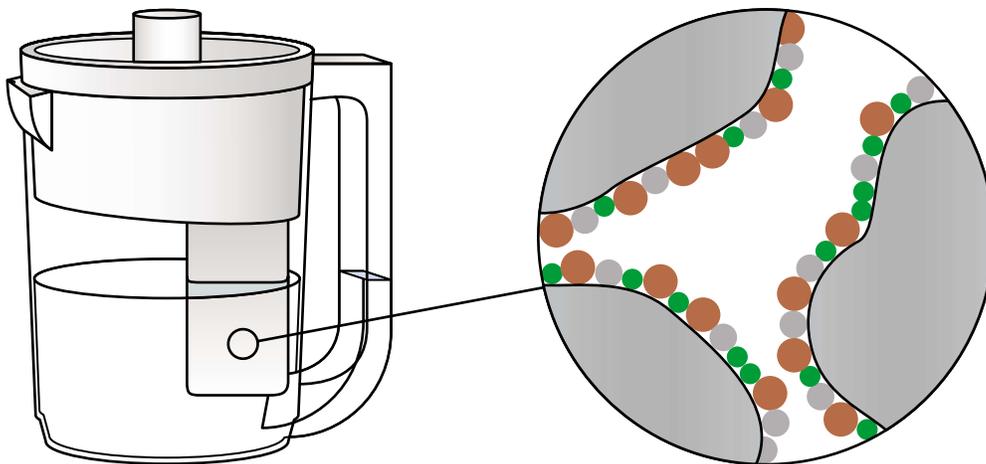
The round beads should have more blue dye stuck to them.



In the same way, the filter grains in home water filters can be used over and over to remove unwanted atoms from the drinking water.



Eventually the filter grains get full and cannot remove any more atoms.



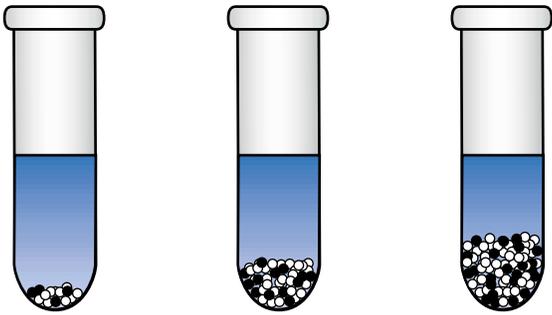
Then you need to replace the filter with a new one.

Experiment!

Experiment 1

How many filter grains do you need to remove all the dye molecules?

Find out by adding different amounts of grains to different tubes.



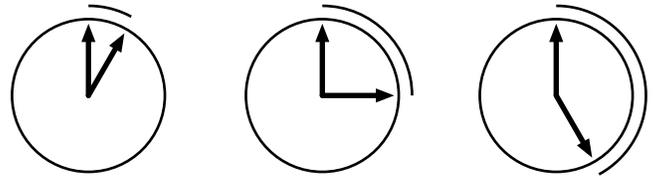
Make sure you add the same amount of dye to each tube.

Make sure you shake all the tubes for the same amount of time.

Experiment 2

How long do you need to shake to remove all the dye?

Try shaking different tubes for different times.



Make sure the only thing that is different between the tubes is the shaking time — put the same amount of grains and dye in each tube.

Try your own experiments.

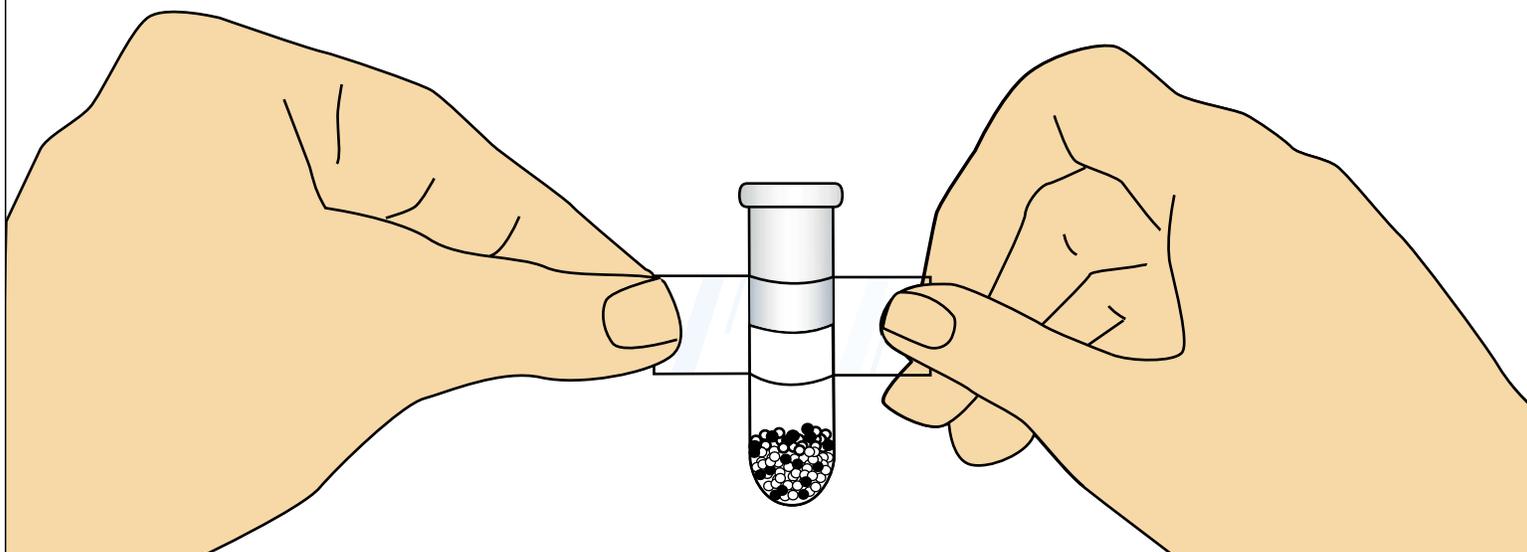
Remember to change only one thing at a time, so you know why you see a difference between tubes.

Do you have questions about your experiment,
or about molecules and water filters?

Maybe you can find the answer by
experimenting some more.

Ask a staff person if
you need help.

When you are done, stick the tubes in your Lab Notebook,
or throw them in the trash.



The Biochemistry Discovery Lab project has been funded by generous support from:

The National Science Foundation: The material is based upon work supported buy the National Science Foundation Grant No. 9814954.

Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation (NSF).

The Pfizer Foundation and the Camille and Henry Dreyfus Foundation, Inc.